THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXIV. No. 1634.] LONDON, SEPTEMBER 4, 1894. [46TH YEAR. PRICE 6d.

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Gives a light of 70 to 80 candle power.

Brilliant Light.

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THE "POSITIVE" PREPAYMENT-SLOT-METER.

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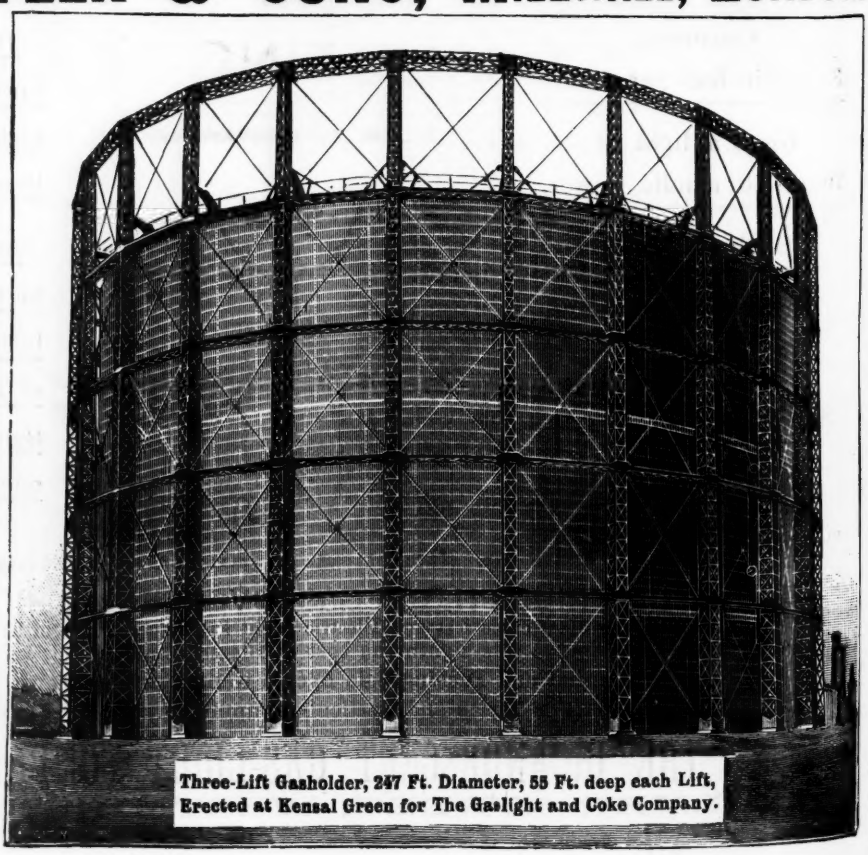

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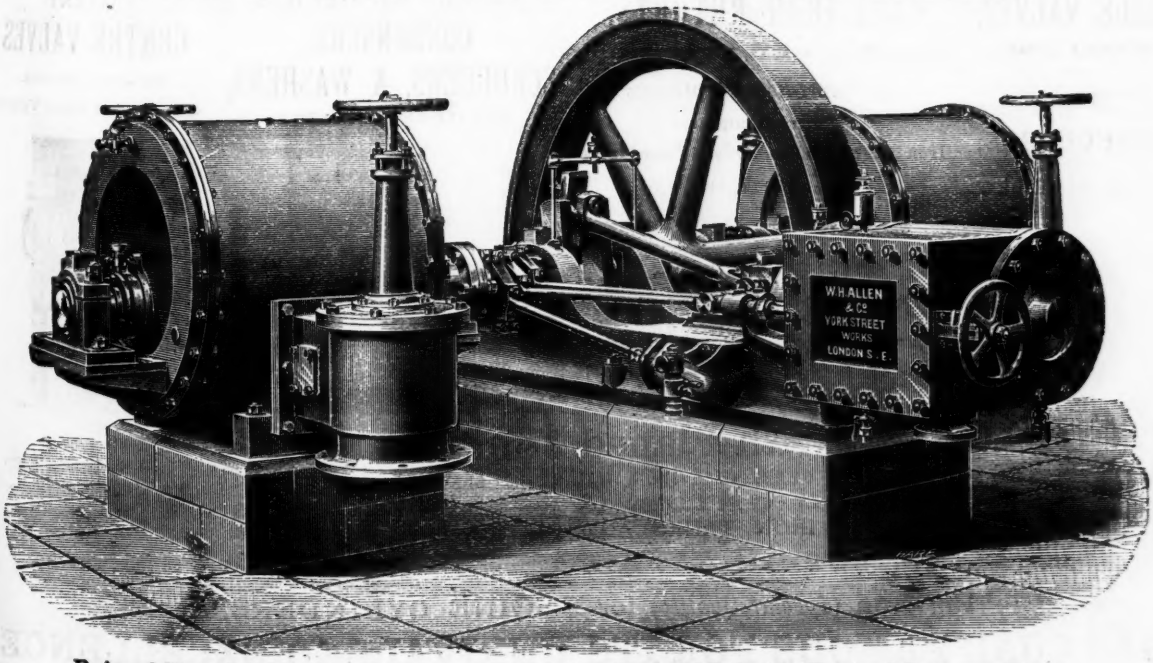

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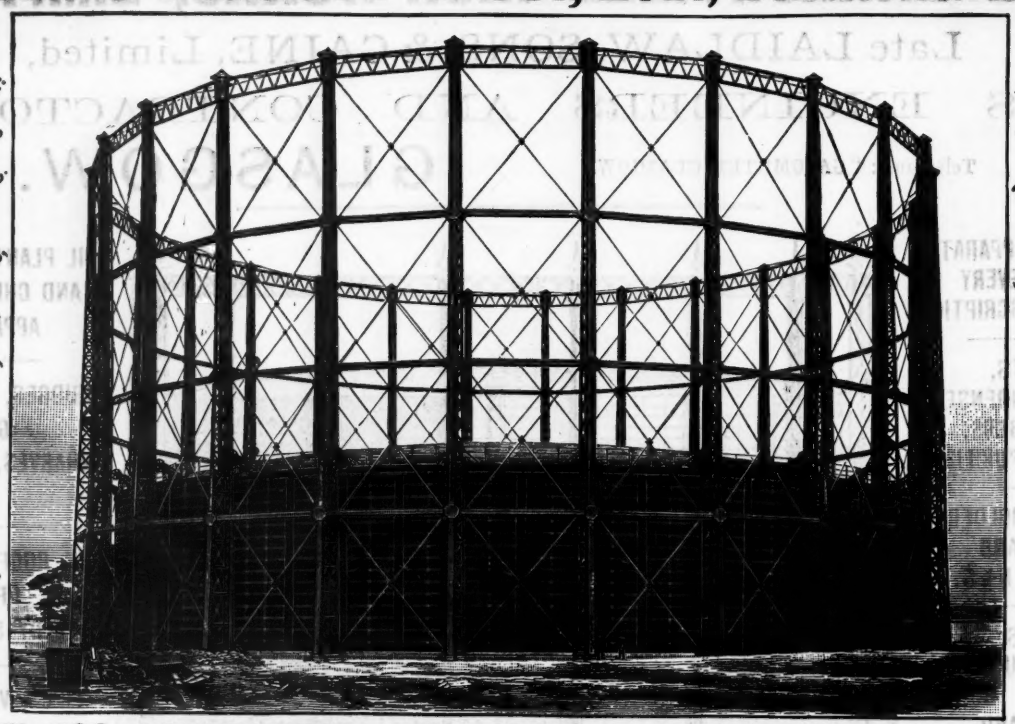

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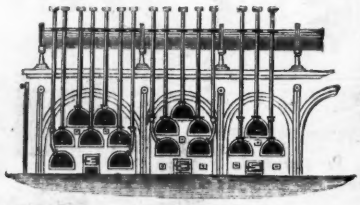
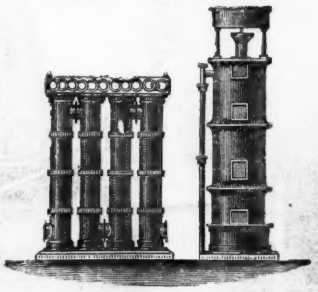
PATENT CENTRE-VALVES

for working Purifiers,

Also Bye-Pass & Stop Valves





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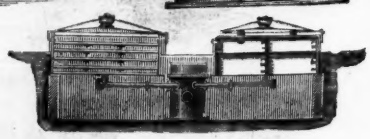

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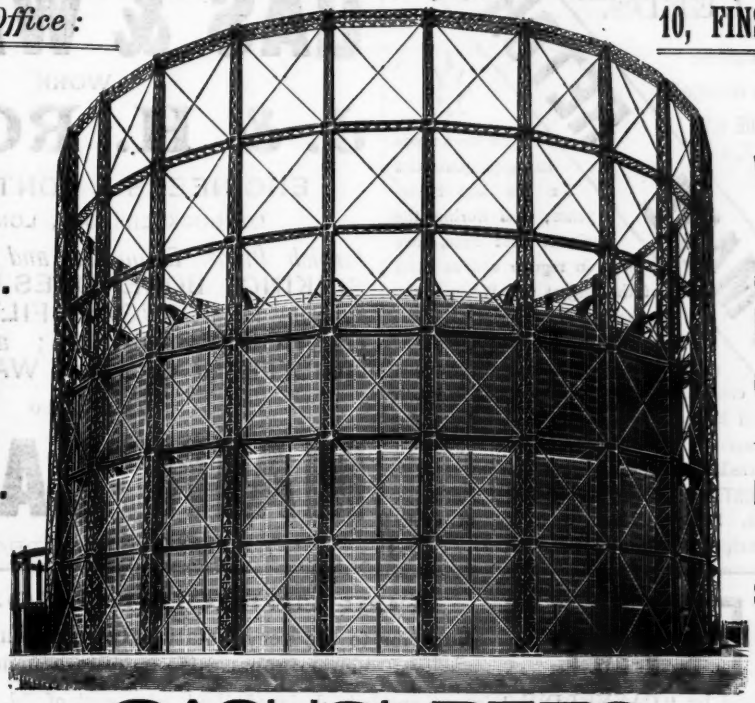

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CLAUS' SULPHUR-RECOVERY PLANT.

CENTRE & FOUR-WAY VALVES.

RETORT-MOUTHPIECES.

SLIDE-VALVES, TAR-BURNERS, SIEVES, &c., &c., &c.

The above is a view of the largest Gasholder (four-lift) of The Gaslight and Coke Company, Beckton, containing 8 million cubic feet, erected by us in 1892.

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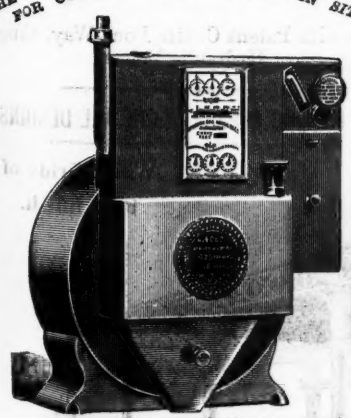
THE AMOUNT OF GAS GIVEN IN EXCHANGE FOR COIN CAN BE ALTERED IN SITU.



The persistent efforts of the Inventors of our Meters have been crowned with

SUCCESS.

There can be no two opinions on the question of the priority of our claim to the consideration of Gas Companies as *the First* Introducers, on a Practical Scale, of a Penny-in-the-Slot Meter.

THE AMOUNT OF CASH PLACED IN THE BOX IS RECORDED. THIS IS A COMPLETE CHECK AGAINST FRAUD.

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So long ago as 1889, we advertised our Penny-in-the-Slot Meters as having the now fully-recognized advantage of ability to alter IN SITU the amount of Gas given per Coin. Automatic Meters without Coin-Counting Index are liable to be tampered with.

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MACHINE-MADE RETORTS

Have been made in large quantities for the last twelve years; and during the whole of that time, have been in regular use at most of the largest Gas-Works in the Kingdom. They possess the excellent quality of remaining as near stationary as possible under the varying conditions of their work—a quality which will be appreciated by all Gas Engineers and Managers. The generally expressed opinion is that these Retorts are the very best that are made.

RETORTS CAREFULLY PACKED FOR EXPORT.

Fire-Bricks, Lumps, Tiles, &c., &c., of every description suitable for Gas-Works.

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GAS & WATER WORK

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INCLUDING

MAIN LAYING

EXCHANGE TELEPHONE 1756.

"CANNELINE"

FOR ENRICHING COAL GAS.

Superior to the very Volatile Hydrocarbons; requiring only a simple apparatus, at quite a nominal cost.

Coal Gas can be enriched by "CANNELINE," in our specially designed plant, at a cost of ¾d. per Candle, showing conclusively its vast superiority over all other Enriching Agents, including Cannel Coal.

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"DEMPSTER, ELLAND."

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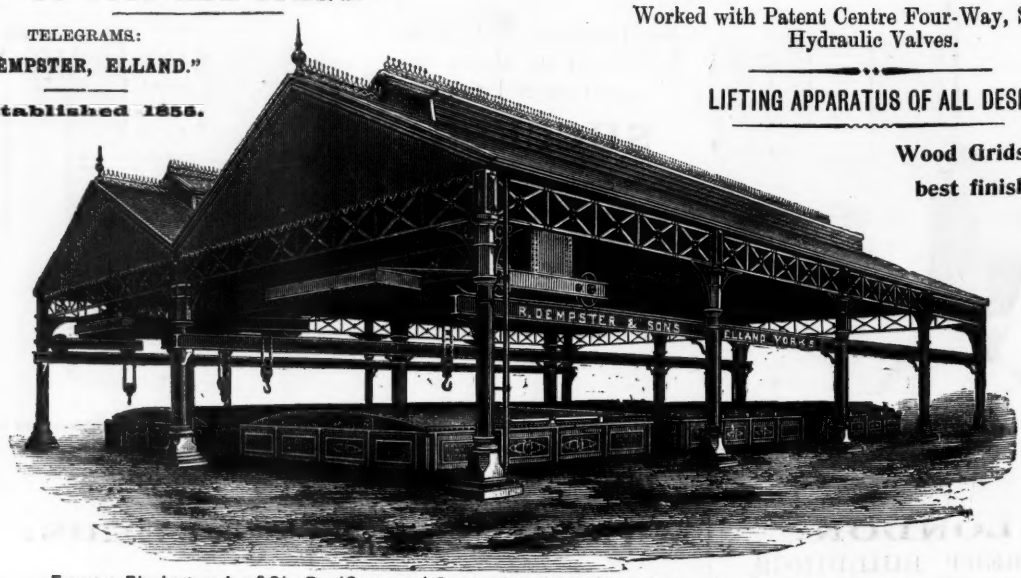
PURIFIERS,

WITH PLANED JOINTS,

Worked with Patent Centre Four-Way, Single, or Hydraulic Valves.

LIFTING APPARATUS OF ALL DESIGNS.

Wood Grids of best finish.



From a Photograph of Six Purifiers and Superstructure, the whole of which were erected by us.

WEST'S GAS IMPROVEMENT COMPANY, LTD.,

ALBION IRON-WORKS, MILES PLATTING, MANCHESTER.

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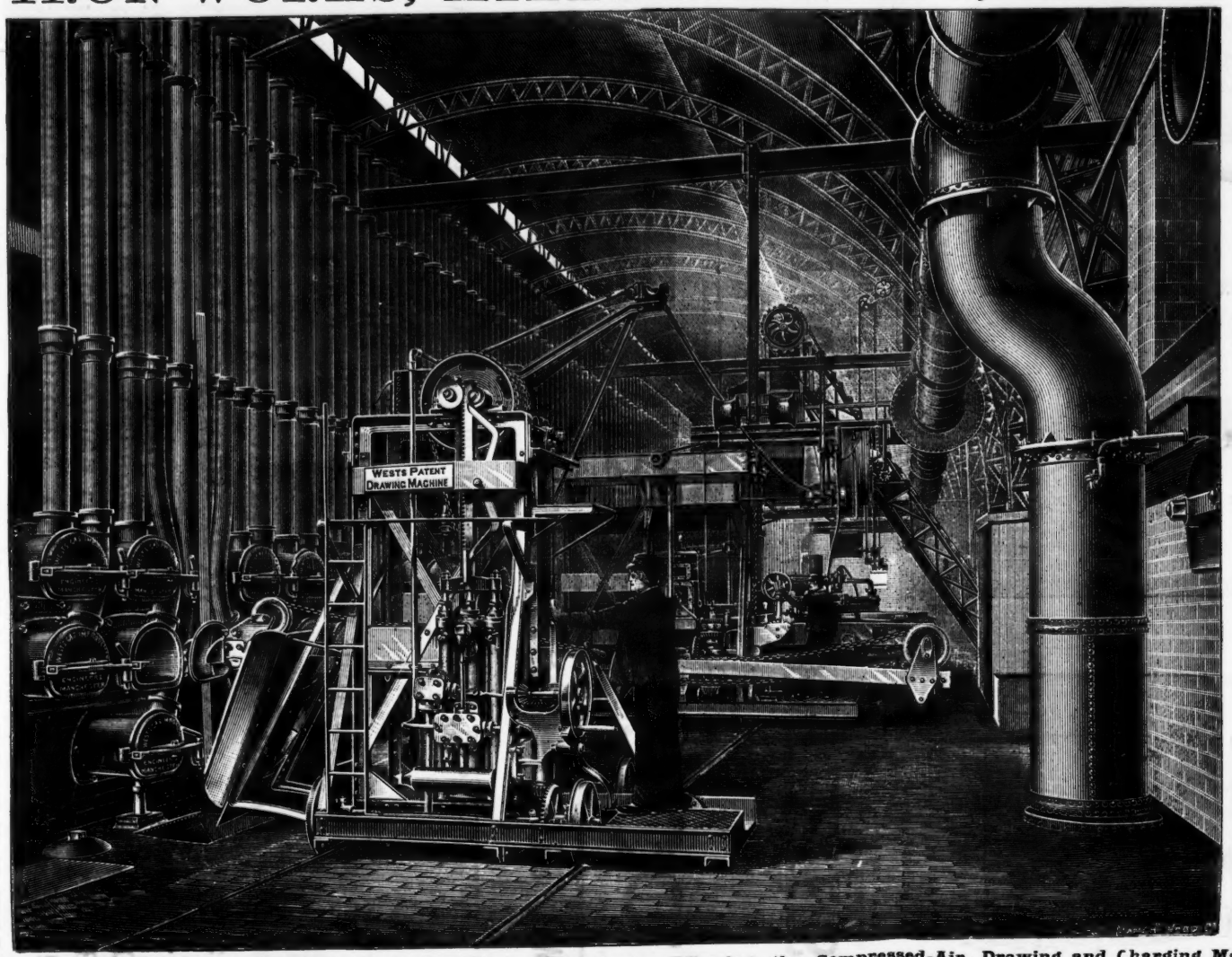
WEST'S MANUAL AND POWER MACHINERY FOR CHARGING AND DRAWING GAS-RETORTS.



Interior of Retort-House at the Bradford Road Gas-Works, Manchester, showing the Compressed-Air Drawing and Charging Machines.

AND

104, Queen Victoria St.,

LONDON, E.C.

OVER

560,000

LINEAL FEET

OF

RETORTS DAILY

ARE CHARGED AND DRAWN BY

WEST'S MACHINES.

KIRKHAM, HULETT, & CHANDLER'S,

PATENT LIMITED,

"STANDARD" WASHER-SCRUBBERS

These Machines are admittedly the most efficient of any in the Market, as evidence of which the fact is stated that 478 of them, equal to a daily capacity of 461,972,000 cubic feet of Gas, are in operation or in course of construction.

Maximum Efficiency. Minimum Wear and Tear, Back Pressure, and Power required to drive.

Machines recently erected at Beckton, Devonport, Dorking, and Accrington, and in hand for Antwerp, Silvertown, Berlin, Marlborough (U.S.A.), &c.

Sole Agents in Gt. Britain for Marshall's Patent Tar-Extractor.

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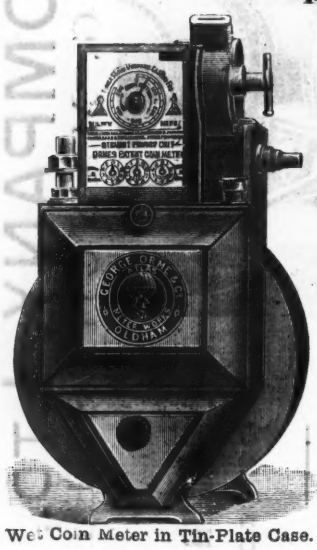
ATLAS METER WORKS, OLDHAM.

ORME'S PATENT COIN PREPAYMENT METERS.

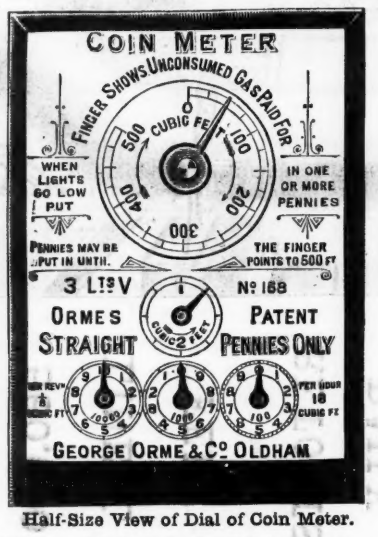
Wet Meters in Cast-Iron and Tinplate Cases. Dry Meters in Tinplate Cases.

NEW PATENTED ARRANGEMENT FOR ALTERING THE SELLING PRICE OF GAS.

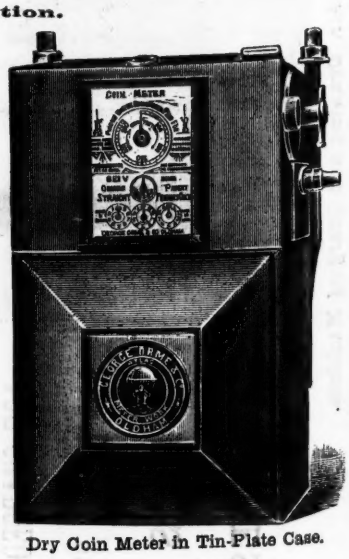
Full Particulars sent upon Application.



Wet Coin Meter in Tin-Plate Case.



Half-Size View of Dial of Coin Meter.



Dry Coin Meter in Tin-Plate Case.

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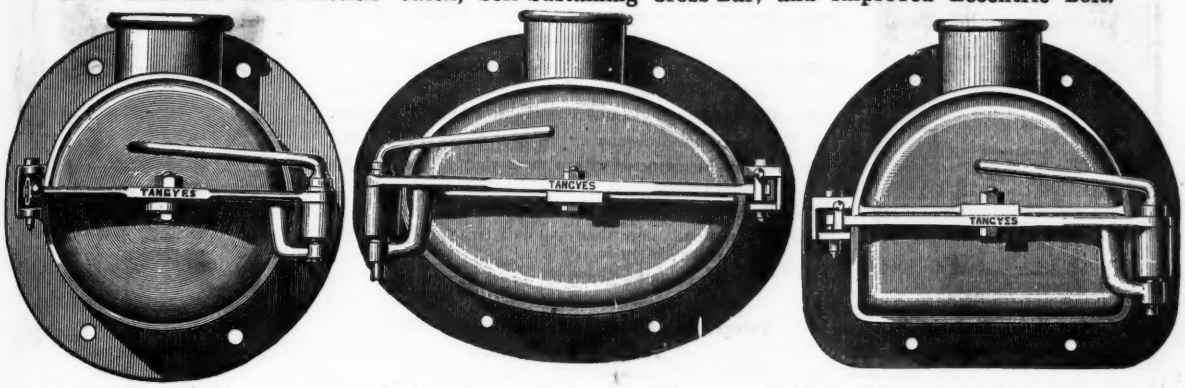
MORTON'S SELF-SEALING RETORT-LID,

With Holman's Anti-Friction Catch, Self-Sustaining Cross-Bar, and Improved Eccentric Bolt.



These Retort Lids and Fastenings are made in three forms, round, oval, and ⌂ (as shown above), in each of which we have a very extensive variety of patterns, from which Gas Engineers contemplating the adoption of these Lids are recommended to make their selection, in order to avoid cost of pattern-making, delays, &c., &c.

QUOTATIONS WILL BE GIVEN ON RECEIPT OF PARTICULARS OF REQUIREMENTS.

LIST OF PATTERNS ON APPLICATION.

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Illustration of BATHURST Holder, 82 feet diameter by 18 feet deep each Lift.

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MANCHESTER (4 Holders).
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DENTON.
ASKE.
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SELBY.
SLIGO.
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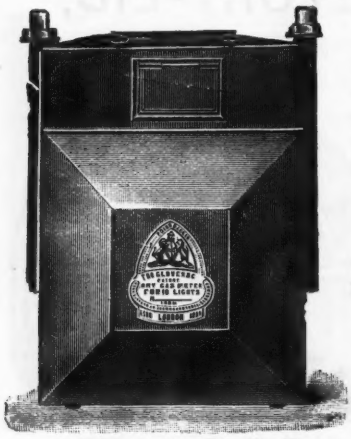
LONDON, 1851. NEW YORK, 1853. PARIS, 1855. LONDON, 1862. DUBLIN, 1865. PARIS, 1867.

THE SIX MEDALS AWARDED TO THOMAS GLOVER'S PATENT DRY GAS-METERS;
The latter being the Highest Award for Dry Gas-Meters at the Paris Exhibition, 1867. Since then we have not Exhibited FOR PRIZES.



1st.—Are a remedy for all the defects of Wet Meters.
2nd.—Are suitable for all Climates, whether hot or cold.
3rd.—Incur no loss of Gas by Evaporation.
4th.—Cannot become fixed by Frost, however severe.
5th.—Are the most accurate and unvarying measurers of Gas.
6th.—Prevent jumping or unexpected extinction of the Lights.
7th.—May be fixed either above or below the level of the Lights.
8th.—Cannot be tampered with without visibly damaging the outer case.
9th.—Will last much longer than Wet Meters.
10th.—Will not cost more than one-half for repair that Wet or Water Meters do.

Are upheld for five years without charge.

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Telephone No. 6725.

THOMAS GLOVER & CO.,

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BRISTOL: 62, VICTORIA STREET. *Telegraphic Address: "GOTHIC."*

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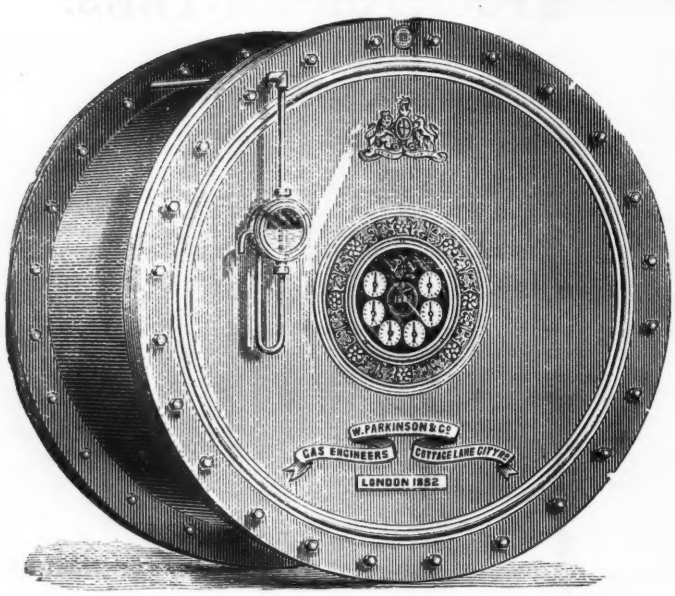
W. PARKINSON & CO.



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IN

ROUND or SQUARE TANKS.

500 STATION METERS,

Varying in size from **1200** to **250,000** cubic feet per hour, have been sold, fitted with

THREE-PARTITION DRUMS.

DURABILITY UNEQUALLED. SOME HAVE BEEN IN CONSTANT USE FOR OVER 60 YEARS.

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10, MAWSON'S CHAMBERS, DEANSGATE,
MANCHESTER.
Telegraphic Address "PRECISION."
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No notice can be taken of anonymous communications. Whatever is intended for insertion must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, SEPTEMBER 4, 1894.

Petroleum or Gas for the People?

PLAIN men may be pardoned for expressing doubts respecting the proper course to be taken for dealing with the great and apparently growing evil of petroleum lamp accidents. That the use of this means of lighting is attended with far more risk to life and property than that accruing from any other, is a fact which from time to time attracts the attention of the Government, the local authorities, and the newspaper press of the United Kingdom. But when it comes to drawing inferences from the disclosures of coroners' inquests and the reports of the fire brigades, confusion supervenes. It is extremely difficult to form a reliable judgment respecting the comparative danger of different systems of artificial lighting, without knowing a variety of highly important incidental circumstances which it is hardly possible to fairly reckon with. There are only three, or at most four, methods of artificially lighting a modern interior of any class; and these methods are commonly selected for reasons into which the factor of comparative safety does not enter. We light our domiciles and places of business by means of electricity, gas, petroleum, and in a minor degree with candles, and in the majority of instances by some combination of two or more of these means. All of them will set a house on fire under certain conditions; and the three most powerful and convenient illuminants will also kill people on occasion. Upon general principles, these systems of lighting cannot be equally deadly or hazardous; but when recourse is had to the statistics of casualties traceable to their agency, the indications to be derived from this source can only be used with extreme caution for the purpose of comparing risks. If all the means of lighting were equally safe or equally dangerous, obviously the one most in use would supply the greatest number of mishaps. If only one house in a particular district were lighted by electricity, while a hundred houses used gas, and two hundred employed oil-lamps, it is evident that these numbers would have to be taken into consideration for a sound judgment as to the comparative danger of these different means of lighting to be formed from the mere statement of the number of accidents arising in the district, and directly traceable to lighting systems. Electric lighting stands high for safety, according to fire brigade returns; but this may be accounted for by the lights being fixtures, and by the fittings being pretty closely looked after in the interest of the insurance offices, as well as by the superior class of people to whom the use of this means of lighting is confined. Gas-lamps are also fixtures; but gas is a light of combustion, capable of setting fire to inflammable substances brought into contact with, or improperly near to, its flame. Moreover, there are escapes of gas; and the human race has not yet reached the level of intelligence when nobody will commit the folly of looking for a gas leak with a naked light; and gas will suffocate people who inhale enough of it. With regard to petroleum lamps, the feature of portability puts this means of lighting upon an entirely different footing from either electricity or gas; and it introduces an incalculably greater element of danger, even if it were as little hazardous to move a lighted lamp as to carry a lighted candle. This was the fact when vegetable oils only were burnt in lamps; but the advent of cheap mineral oil which, under certain easily secured conditions, will burn as well without as with a wick, has changed all this, and immeasurably for the worse. Moreover, the cheap mineral-oil lamp is in greatest use by a class of people who can least be trusted to observe care in such a matter as lighting. Putting the danger of this means of illumination at its very worst, hardly a week passes without supplying instances of the misuse of lighted oil-lamps as handy missiles in domestic broils.

The question has been repeatedly asked as to whether something cannot be done to reduce the risk of lighting by mineral-oil lamps; and it has been answered in two senses—one referring to the construction of the lamp, and the other to the flash-point of the oil. The Scottish shale oil interest, which has suffered greatly from the competition of petroleum lamp oils, has a remedy ready to hand, which has been cried from the housetops and urged upon the Legislature with a persistence and a show of confidence in its efficacy that has gone far to create a general impression in its favour. This is simply to raise the flash-point of lamp oils from 73° to 100° or 105°, which also happens to be the natural flash-point of Scotch paraffin oils. Those who favour this remedy jeer at the idea of trying to improve lamps; and they will have it that the cure must be applied to the oil. Unfortunately for this contention, it cannot be shown—what should logically follow—that oils with a high flash-point are always and everywhere innocuous. And the active part taken by representatives of the stricken Scotch paraffin oil industry in this argument can only be understood in one sense. Of course, they are all public-spirited and honourable men. But the fact remains that the Scotch shale oil industry would be placed in a

position of a protected manufacture at the expense of the general community, if the demands of its representatives were acceded to; and a much stronger case will have to be made out before this state of things is brought about in Free Trade England.

An instructive article upon the subject of the petroleum trade appeared in *The Times* on Thursday last, in which this point is very forcibly made. After remarking that, in deference to the persistent agitation on the subject, a Select Committee has been sitting to investigate, not indeed the vital question of the flash-point alone, but the whole question of the legal regulation of the petroleum oil industry, the writer of the article roundly declares that "whatever the scope or the tendency of the investigation "thus set on foot, it is as well for the British public to "understand that the real motive power of the whole affair "is a desire to obtain protection at the expense of the "general consumer for the Scotch mineral oil trade. It "is this part of the business that has money and political "influence behind it; while amiable efforts to improve "lamps and obtain better regulations for its storeage "excite little more than a languid academic interest." The writer shows later how hollow is the pretence that a high flash-point is a guarantee for safety. As a matter of fact, some of the worst casualties on record have been due to the use of oil having an extremely high flash-point. Lord Romilly lost his life by the overturning of a lamp burning an expensive and highly-refined oil with a flash-point much above 100°. The destruction of the *Goliath* training-ship by fire, with the loss of many lives, was directly traceable to the use of an oil which had been specially procured of a very high flash-point—no less than 144°—with the idea of promoting safety. Since the appearance of the article, a correspondent of *The Times* has written to say that these observations confirm his own experience in the use of high-test oil. He had had nine or ten lamps in use in his house for ten years without an accident; but a few weeks ago, having been warned of the danger of inferior oils, he obtained a supply of high-test quality. His prudence was rewarded within a fortnight by the explosion of one of his lamps. The firm who supplied the oil immediately had a sample of it tested; the result being a proof that it was a genuine high-test oil. The general conclusion to be drawn from this conflict of claim and evidence is that no mineral lamp-oil can be rendered absolutely safe by tinkering at the flash-point; while with metal-bodied lamps, in which the burner is so constructed that the flame cannot get at the contents of the reservoir, and in which there are no loose parts to fall out or permit leakage in the event of the lamp being thrown down, the present legal grade of oil is likely to prove as safe as another.

All this controversy should encourage those who are responsible for the popularization of gas to persevere in their endeavours to facilitate the employment of this means of lighting where it is likely to do most good. "Let Scot "and Yankee tear and fight, as 'tis their nature to," over the question of the flash-point of lamp-oils; but, meanwhile, they are only discrediting the use of all these oils for nervous people, and room is made for the fixed gas-burner, which cannot be accidentally knocked over or dropped, and is certainly unavailable as a weapon of offence in the hands of people whose manners, albeit they may be decent citizens in the ordinary way, "have not the repose that "stamps the caste of Vere de Vere." Better a prepayment meter than a jar of potential fire and death in the cottage.

The Croydon and Carshalton Amalgamation.

The half-yearly meeting of the Croydon Gas Company, reported in another column, is especially noteworthy as being the first that has been held since the amalgamation of the Croydon with the Carshalton undertaking—an interesting operation that does not now fall to be frequently chronicled. The reasons which led to this development in the case of Croydon and the neighbouring gas supply district of Carshalton are very plainly and succinctly stated in the speech of Mr. C. Hussey to the united proprietors. The Croydon Company wanted something which annexation of the Carshalton undertaking would give them; and they were prepared to pay something, in the shape of a reduction in the price of gas in the Carshalton district, for the advantage which they would derive from taking it over. Consequently, all parties concerned came to terms over the transaction; and there was no opposition by the Local Authorities to the passing of the necessary Bill for legalizing the union of the undertakings. The Chairman's story reads like a fairy tale; and one can only hope that the usual terminal formula that "they lived happily ever after" is not out of place in connection with this narrative of an auspicious union. With regard to the circumstances of the consolidated Company, the fact that the Directors can see their way to selling gas in this suburban district at 2s. 9d. per 1000 cubic feet, is ample testimony to the excellence of the management of the Company and the works, upon which the Directors, the Engineer (Mr. James W. Helps), and the Secretary (Mr. W. J. Russell) are to be congratulated. Mr. Helps is doing very good work at Croydon; and we are glad of this opportunity for calling attention to the fact, although, of course, it is not news. One other matter we are constrained to mention in connection with this Croydon-Carshalton amalgamation, and that is the praiseworthy manner in which the individual interests affected have been looked after. Two of the Carshalton Directors—Mr. G. J. B. Jackson and Mr. Samuel Spencer—have seats on the Croydon Board; the retiring Directors being compensated by a payment as arranged. The respected Manager of the Carshalton works—Mr. R. Good—has retired with a provision equal to his full salary and an equivalent for the house he occupied. In addition, Mr. Good was presented with a cheque for 100 guineas, and a testimonial on vellum, in recognition of his 27 years' faithful service, and of the utility of his several inventions, especially the oil enrichment process, which has been of great use to the Company for the past six years. Mr. Dudley, the ex-Secretary, was also pensioned, and presented with a cheque and a testimonial. These things are a great solace to hear of; and it cannot be doubted that employers who recognize their employees' worth in this style, get more than thanks and praise in return for their just generosity.

The Improvement of Street Lighting Arrangements.

It is a source of considerable satisfaction to us that our last week's observations upon the usual inappropriateness—to give it no harsher term—of the British street lamp-post has aroused the echo that appears in our "Correspondence" column to-day. It is greatly to be hoped that these remarks may have awakened a sympathetic chord in other breasts than Mr. Brackenbury's, so that those who have the power will not delay sending the worst of these unsatisfactory gas-fittings that deface London and other cities to the scrap-heap which has awaited them too long. Like our correspondent, we "love our little London;" and we grieve over the gross Philistinism that denies to the greatest city of the world so much that is its due in the matter of gas lighting, and other things. Our correspondent's whimsical reason for excusing the scantiness of lamp-columns in the streets is amusing; and his praise of the Tower Bridge lighting is well deserved. The truth of this matter is that the example of lighting in question was thoroughly thought out by experts, who knew what was required and how to supply it. The result, by common consent, is as simply good, sufficient, and unobtrusive street lighting as can be seen anywhere. Why is there not more of this? Mainly because public opinion has not been properly formed and aroused in this regard—because local authorities have starved gas lighting, and thought any pattern of lamp-columns and lanterns good enough that could be provided and maintained at a minimum of expense. It is high time that our municipalities were shaken out of this habit. As a nation, we have been much too neglectful of the obligation to cleanse not merely the surfaces of our roadways and footpaths, but also the fittings and façades that give upon them. We use plenty of soap and water on our persons, and uphold "the order of the bath" in a manner not unworthy of our professed belief that "cleanliness is next to godliness." But when it comes to washing down shop and house fronts, lamp-columns, and other erections liable to be splashed and fouled by the traffic of our crowded streets, we are simply nowhere in comparison with our Continental neighbours. It is a sign of grace that certain new buildings in London and other large English towns are built and faced in ways that will permit of the salutary play of a hose-pipe upon their exposed surfaces; but this is only the beginning of what would be a great reform if it were

seriously taken in hand. The England of the town would not know itself if its face were thoroughly washed now and again. For our part, we have most solicitude for the public lighting fittings; and if any efforts on our part can avail to bring to pass the much-needed improvement of these humble expressions of civilization, they shall not be spared. As Mr. Brackenbury declares, "yet there is "hope;" and in this hope gas engineers must address themselves to the enlightenment of those who do the lighting of British towns.

Water Gas and the Price of Oil in Belfast.

It cannot be gainsaid that, in the report to the Gas Committee of the Belfast Corporation, which we reproduce elsewhere, Mr. Stelfox has carried the cause of carburetted water gas a long step farther forward than it has hitherto attained in any part of the United Kingdom. The position of the Gas Engineer to the Belfast Corporation in regard to this matter has been sufficiently clear for some time past. After his Gas Institute paper, it only remained for him to go on with the development of gas making by the system to which he gave such imposing credentials; and it is therefore what might have been expected of him that, upon the first opportunity, he would recommend his Committee to largely extend this order of their plant. As Mr. Stelfox's suggestions have been adopted by the Corporation, Belfast will before long be in possession of the largest water-gas installation in the kingdom. It is only necessary to refer to Mr. Stelfox's Gas Institute paper to find out why he likes the system. Cramped for space to the point of desperation, and liable to be cumbered up with coke, the Belfast Gas-Works is just the place for a carburetted water-gas plant, which not only takes up less room than retorts, but absorbs the surplus bye-product of the latter. And then Mr. Stelfox gets his oil practically at first hand. It is a satisfactory proof of the accuracy of our views upon the important question of the cost of oil suitable for gas making, that whereas this commodity stood at 3¼d. per gallon in Belfast when the water-gas plant was ordered, by the time it was actually needed the price had gone down to 2½d. per gallon; and now a supply has been purchased for two years ahead at the low rate of 2d. per gallon. Making allowance for the difference in the capacity of the standard measures of the two countries, this figure is not far from 1½d. per American gallon; and that it should pay anybody to deliver oil of any kind whatever in Belfast at such a price, is something very remarkable, even when all due allowances are made for the favourable situation of the city as a port. How much more would it cost to get the same stuff to Manchester through the Ship Canal? At any rate, gas-oil at the price named is a factor of the commercial problem of gas making in this country which may be expected to produce consequences that could not have been foreseen a year or so ago. This is really, though it appears as almost an incidental statement, as important as anything in Mr. Stelfox's report.

Lights and Lighting.

The communication from Mr. Thomas Newbigging which appears in another column undoubtedly helps to carry on the discussion on the subject of illuminating power and lighting effect. It is inevitable that, when a controversy of such a character as the present is started, there will be at the commencement a varying degree of ambiguity of expression on the part of those taking part in it from different standpoints, although their meanings may be tolerably clear to the writers themselves. It has been so in the present instance; and we are only now able to distinguish the essential difference that exists between the hard-and-fast photometrists, and those who, like Mr. Newbigging, think that photometry as ordinarily practised does not convey all that is to be regarded in respect of the useful effect of artificial lights. Of course, photometry is a reliable method of ascertaining, with a tolerably close approximation to the truth, the comparative illuminating power of two opposed light-sources, when observations are made in accordance with certain definite conditions, of which not the least relates to the preparedness of the observer's eyes. The question that has lately arrived at a somewhat acute stage, however, is not so much one of photometry, as of the ordinary use of the eyes when exposed to the direct action of lights, as well as of their light when reflected from the various objects rendered visible by them. This appears to be the gist of the matter; and it is a subject of interest not confined to gas engineering circles, inasmuch as it occupies the borderland between physics and physiology. Commenting upon the same point of lighting practice, the *Electrician* recently observed that "low lamp standards and clear glass globes would give a high "mean illumination as measured by a photometer; but the "effect would not only be very unpleasant, on account of the "glare, but the pupil would become so contracted that the "eye would receive less light in the neighbourhood of a "lamp than that which would be indicated by ordinary "photometric methods." This statement referred more particularly to arc lamps. But the principle applies to all systems of lighting; and it remains for further research to show the degree in which the intrinsic brilliancy of an artificial light-source influences the perceptive powers of eyes exposed to, and at the same time expected to see by it. Broadly speaking, with the exception of lights employed for decoration and for what may be called, by coining a term, *pharic* (*pharos* = a lighthouse) purposes—which embraces, as we have often maintained, the majority of street lamps—people do not desire to have the means of artificial lighting forced upon their notice. The effect is what is wanted, irrespective of the source; and this is the aspect of the lighting question with which photometry only indirectly or inferentially deals. It is upon just this point of the inference that may be correctly drawn from photometrical measurements of lights as regards their usefulness as a means of illumination, that Mr. Newbigging, and those who think with him in this matter, take their stand; and it is this that needs further investigation.

WATER AND SANITARY AFFAIRS.

We publish in our "Correspondence" columns to-day a letter from Mr. E. Chesshire, F.R.C.S., a member of the Society of Medical Officers of Health, in reference to a leading article on the subject of the Metropolitan Water Supply which recently appeared in the *Daily Telegraph*, proposing as "a good popular cry" the extraordinary motto of "Free Water for the People." The phrase admits of two meanings, according as we adopt its literal interpretation or accept it in some modified form. The idea which our contemporary intends to convey is not rendered so clear as could be wished; and anyone might suppose that the words were to be understood as referring to a supply of water given "free, gratis, for nothing." In that sense our correspondent deals with it; and he reasonably contends that, if the consumer gets his water as an absolute gift, somebody must nevertheless pay for it. Mr. Chesshire carries his argument forward another step, by asking why water should be given free unless the principle can be applied in other directions. He declines to investigate the question as to how such a change is to be brought to pass; but perhaps it would be well to consider the possible *modus operandi*. The process is plain enough—at least in theory. It simply consists in a public authority buying up certain property, and then making the interest on capital and the working expenses a charge on the rates. Let everybody, as represented by such an authority, possess everything, and then all supplies can be made free, or may seem to be so. Tramways may thus be acquired, and nobody need pay for a ride. In like manner, gas bills may be superseded, or the electric light provided gratuitously. Railways can, of course, be dealt with in the same fashion, and then there will be "free transit for the people." As Mr. Chesshire suggests, we may even go on to have beef and mutton for nothing; and, to crown all, there will be a "free press," inserting advertisements without charge—a point which perhaps has not occurred to the *Daily Telegraph*. Such vaticinations may be denounced as sheer extravagance; but it happens that something already exists which travels on the same lines, though as yet falling short of the full distance. It is a singular circumstance that the germ of the "free supply" system makes its appearance in the report of the Royal Commission on Water Supply in 1869; the Commission recommending in regard to the Metropolis that the water supply should be entrusted to "a responsible "public authority," which should have the power of levying, as at Manchester and Glasgow, two rates—one a special and domestic rate on all dwelling-houses, and the other a public or general rate upon all rateable property. It is easy to see how, upon such a basis, by raising the general rate and lowering the domestic charge the latter

could be brought to a vanishing-point. Practice at present falls short of this; but in the degree to which it exists there is the abatement of the water-rate, and an approximation to a "free" supply, so far as undisguised water-rates are concerned.

We now come to the second interpretation of this "Free Water for the People." If the phrase is not to be taken in its literal significance, as meaning a supply without charge, it must signify a supply without conditions. Pay for your water pure and simple, without extras, and then do as you like with it; wash your face or your feet, just as you choose, have your fixed bath, water your garden with a constant flow, wash your carriage—in short, use the water for any purpose to which it can be made applicable, and use it to any extent. The Companies may say they cannot supply water enough for such prodigal consumption; but that is their own fault, and they ought to go farther and find more. "The supply of water ought not "to be limited;" all London should have "a constant "and ample flow." Perhaps the County Council would be prepared to give all this; but we greatly doubt it. Entertaining these lofty views of what a water supply should be, it naturally follows that the *Daily Telegraph* is altogether scandalized at a separate charge being made for a supply to a fixed bath. Yet the legality is acknowledged; for Mr. Justice Chitty has given judgment in favour of the Lambeth Company on that point. Only we are told that such a law ought not to exist, and Parliament ought never to have allowed it. Still, there it is; and unquestionably there is reason for it, though certain agitators in Lambeth have made what they call the "bath-tax" serve the purpose of "a good popular cry." Mr. Justice Chitty having settled the main question, there has been an attempt to show that the Company have no right to cut off the entire supply from a dwelling when payment is refused for the fixed bath. Mr. Denman has just decided at the South-Western Police Court that the Company have this right. All points seem now to be disposed of. Yet there is a project in the air for a Water Consumers' Defence League, which people are invited to join, presuming they are "prepared to contribute to its "funds." Protection against agitators who neither know the law nor care to observe it, might be of some service.

Mr. C. Kay, the Secretary of the Douglas (I.M.) Gas Company, has been appointed Manager, in succession to the late Mr. W. Smith; and he will henceforth fill the two positions.

Mr. R. G. Whincop, an old official of The Gaslight and Coke Company—having been in their service for upwards of 41 years—was recently seized with paralysis while working at his desk in the Stoke Newington office, and succumbed to the attack.

The Late Mr. Alfred Williams, whose death on July 20 last was recorded in the JOURNAL at the time, has bequeathed all his real and personal estate (the latter being valued at £17,000) to his wife, Mrs. Frances Williams, subject to two bequests of £100 each, free of legacy duty, to his Executors.

Death of Mr. H. L. Hammack.—We regret to record the recent death, in Germany, in his 68th year, of Mr. Henry Lawrence Hammack, whose name is well known in connection with several important gas undertakings. As far back as 1866, Mr. Hammack succeeded his father Mr. John G. Hammack on the Board of the Ratcliff Gas Company; having at an earlier date had some training in the office of that Company, of which Mr. John Hammack was for many years Chairman. That undertaking, as our readers are aware, was acquired by the Commercial Gas Company; and Mr. Henry Hammack then became a member of the Board. He was also a Director of the Oriental Gas Company, of Messrs. W. Sugg and Co., Limited, and of the Tower Hamlets Cemetery Company; and he was Chairman of the Colonial Gas Association. He was a Justice of the Peace for Middlesex and a Deputy-Lieutenant of the City of London, of the Corporation of which he was one of the oldest members. He for many years represented Bishopsgate Ward, of which he held the deputyship; and he had passed the chair of most of the Corporation Committees. By profession, the late Mr. Hammack, like his father, was an architect and surveyor; being at the time of his death senior partner in the firm of Messrs. Hammack and Lambert, of Bishopsgate Street. Deceased had for several years suffered from a painful internal malady; and he had been spending a few weeks in Germany with his family in the hope of obtaining some relief. Notwithstanding the serious nature of his ailment, his great fortitude, patience, and recuperative power were the subjects of constant remark by those with whom he was associated. Always kind-hearted, courteous, and considerate, he endeared himself to the whole of a very wide circle of private, civic, and professional friends, by whom his loss will be keenly felt.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 485.)

THERE is little to note by way of real change in the general attitude of affairs on the Stock Exchange during the past week. Of moving events, there has been none; and the dormant season is slumbering peacefully. In the earliest portion of the week, the tendency was somewhat uncertain and doubtful, which was perhaps to a great extent attributable to some apprehension in regard to the outcome of the fortnightly settlement. There was, however, no considerable difficulty encountered in the adjustment, though one failure was reported. Later on, there was a recovery, and prices did very well; and there was some show of activity, considering the time of year. The demand for choice investments was still in full swing; and gilt-edged luxuries were dearer than ever. The Money Market received its usual ephemeral stimulant from Stock Exchange requirements; but the enormous plethora of surplus money is too great to be much affected by comparatively so slight an agency. The Gas Market has been much quieter. A large number of issues have improved upon their previous quotations; but a conspicuous exception is Gaslight "A," which was displaying symptoms of reaction a week ago, and has now fallen a couple of points. The secured issues, however, kept well up; and "G" rose to cent. per cent. premium. South Metropolitans provided only two transactions in the whole week; but all four issues have advanced in price. Commercials were not marked at all. Several Suburbans and Provincials are better on *ex div.* adjustment—*e.g.*, Bristol, Bromley, and Crystal Palace—and Tottenham, though not officially marked, may fairly be included with them. Continentals were quiet and firm; Imperial advancing a couple of points. Several of the more remote undertakings have improved—the Indian Companies being conspicuously firmer; and Buenos Ayres and Ottoman have also risen in price. There was more activity among the Water Companies than might have been expected, coupled with a rising tendency. East London, Lambeth, and New River advanced in quotation.

The daily operations were: Business in Gas was only very moderate on Monday; and, though prices in general were good, quotations underwent no change. The course of business on Tuesday was much the same—transactions being restricted; and the only variation was a rise in Buenos Ayres. Wednesday was even quieter; but prices indicated firmness in Imperial Continental, and an opposite tendency in Gaslight "A." Bombay old rose ¼. Changes were more extensive on Thursday. Imperial Continental advanced 2; and South Metropolitan debenture, 1; while several issues were quoted better *ex div.* But Gaslight "A" receded 2. In Water, Lambeth 10 per cent. advanced 2; East London and New River, 1 each. Friday was the busiest day of the week; and prices again moved upward. Gaslight "G" rose three; and Oriental, Ottoman, and both Bombay, ¼ each. Saturday produced only one single transaction in Gas; and quotations closed unchanged.

ELECTRIC LIGHTING MEMORANDA.

The Board of Trade Report on Electric Lighting Orders—Breakdowns of Central Station Lighting—The Dangers of the Trolley Wire System of Electrical Tramway Working.

THE Board of Trade report respecting the applications to, and proceedings of the Board under the Electric Lighting Acts during the past year has been issued in the usual form of a parliamentary paper; and it constitutes the most authoritive evidence of the progress of the industry in the United Kingdom. It is stated that 26 applications were received during the period in question, of which 15 were by local authorities and eleven by companies—only one relating to the County of London, and this being for the Crystal Palace district. All the Orders asked for were granted with the exception of two, in which the promoters failed to produce the consent of the local authority, or to satisfy the Board that this should be dispensed with. Four Orders originally granted to local authorities were transferred to limited companies; and three Licences were applied for. The bulk of the report is occupied by a list of all the Provisional Orders confirmed by Parliament prior to last session, and of the Licences granted by the Board of Trade since the passing of the 1882 Act—showing those that have since been revoked or repealed. This statement is mainly an obituary record, illustrating the high rate of mortality that has characterized the large Brush family. The entries are not officially numbered, but we make 283 of them, including Orders and Licences; and upwards of a hundred have been revoked or have lapsed, although in some cases the powers have been renewed in a different form, so that it is difficult to say, from the official entries, how many are actually effective. Many, however, are not likely to be acted upon. There is no mention of the amount of capital involved in any instance. Very few of the heavy early crops of Orders remain valid, whether belonging to companies or local authorities; only seven of those dated 1883 appearing without the stern affix "revoked."

We are not disposed to make too much capital out of the incident communicated in the letter of "A Keswick Visitor" which appears in our "Correspondence" columns to-day.

The Keswick Electric Lighting Company, Limited, appear to have got into serious trouble through making a start before they were quite ready—not an unprecedented circumstance in the history either of gas or electric supply. The most ambitious electric lighting undertaking in London has been brought to financial grief in the same way; and it is obvious that the more important the concern, the more damaging must be these interruptions in the service. Yet it would be an error to conclude from such instances as the Keswick experience that long suspensions of the service are a normal feature of central station electric lighting; for the greater number of these establishments can claim a much better record. Indeed, the greatest drawback to the popularity of central station undertakings has not been so much the risk of long interruptions as the occurrence of occasional brief local breakdowns, which form so regular a feature of the reports of public lighting inspectors in London and elsewhere. Regarded from the standpoint of the partisans of electric lighting, these little mishaps are a small moment; but in cases where it is of cardinal importance that lights shall never be extinguished while wanted, were it only for an hour, those responsible for the integrity of the lighting service are naturally reluctant to depend on such an essentially hand-to-mouth system as direct electric lighting. The Tower Bridge is an instance in point.

It is occasionally said of the JOURNAL, by some of our American technical contemporaries who pay the compliment of regularly studying, and frequently reproducing, our articles, that we are guilty of showing insufficient respect for American industrial methods. This reproach is certainly not well grounded in regard to our treatment of things and persons American which strike our imperfect judgment as meritorious; but the great difficulty of technicians upon this side of the Atlantic in the way of treating American industrial practices as respectfully as they would like to do, is the uncertainty regarding the part played by merit in these matters. The curse of M'Kinleyism is heavy on our Transatlantic cousins; and so many of their industries are controlled by "trusts," that one never knows, when any particular trade appears to be "booming," how much of the apparent effect is due to natural causes, and how much to the skill and financial power of interested parties. Thus it has never been possible to regard the rapid rise of various electric lighting industries in the United States as a genuine industrial development; and even electricians have come to thank the framers of the Electric Lighting Act of 1882 for what they did to put the new industry upon a safe financial basis, so far as the United Kingdom is concerned. Time has been when every British newspaper reporter who visited the States wrote home to tell his benighted countrymen how much more "advanced" Americans were in regard to electric lighting and traction; and during the past year or two, although nobody professed to envy America the "trolley-wire" electrical tramway, it has been understood here that this system, in some way or other, suited the Americans, and had become, as it were, by common consent, a very big thing indeed. At last, however, "the murder is out." Mr. Nelson W. Perry has published a paper in an American technical journal, which, according to the *Electrician*, discloses the general truth that "neither the single nor the double trolley has as yet been adopted in America on its merits." The single-trolley system was pushed because manufacturers wanted to make 200 per cent. profit; and so the speculation was worked all over the Union for all it was worth, with that supreme disregard for the interest of others which is so proud a boast of the "promoter" everywhere, but which is more easily acted upon in the "Land of the Free" than in those effete countries where local government is understood seriously. Mr. Perry admits that the damage that has been done to gas and water pipes in places where the single-trolley system has been applied, is "far more extensive than appears at present, for in most cases it has only been discovered when it has become so extensive as to require the digging up of the pipes where they have been almost totally corroded through. It was years before this corrosion was discovered at all, and it may yet be years before its full extent will be realized in the almost total destruction of our water and gas mains." The remedies that have been tried with a view to preventing this mischief, although they seemed to have worked well in some cases, have signally failed in others; and even when a success has been claimed, it has not infrequently happened that the claimant was mistaken, and that a failure had to be recorded instead. Mr. Perry cites the paper of Mr. Farnham (recently noticed in this column), in which it is asserted that, by the method adopted in Boston, the evil had been practically remedied. But somebody connected with one of the Boston tramways has since stated that whatever remedial effect had been produced by Mr. Farnham's method was merely temporary and local. The mischief is due to the fact, vouched for by Mr. Perry, that electricity does not follow wholly the easiest path. "It will divide itself up among *all* the paths to which it has access, in proportion to the conductivity of those paths." Since gas and water mains have usually a much greater conductivity than any trolley rail expected to convey the return current, it follows from this that the two must necessarily divide the current between them; and, notwithstanding every precaution of bonding or welding the rails, the pipes may still carry even the greater portion of the current. Mr. Perry does not appear to hold a brief for the double-trolley system, for he confesses that in Cincinnati, where alone the system seems to find favour, the complication of wires inseparable from it is at points "most unsightly, and greatly to be deplored." The water and gas mains are reported to be safe; and that is the chief thing.

THE LATE DR. N. H. SCHILLING.

IN the issue of the JOURNAL for July 17 (p. 128), we very briefly recorded the lamented death of Dr. Schilling, whose name is perhaps best known to gas engineers as that of the founder of the *Journal für Gasbeleuchtung*. The services he rendered to the gas industry on the Continent were so numerous and important, that a short review of his life and work cannot but prove acceptable to our readers; and this has been prepared from a lengthy "obituary" in the columns of our German contemporary.

Nicolaus Heinrich Schilling was born in the year 1826 at Neuendeich, near Glückstadt—a small town on the Elbe; his father being a schoolmaster. Two years later, the family removed to Vierlanden, near Hamburg, where Schilling's childhood was spent until he went (when twelve years of age) to school at Glückstadt. His career there was, however, checkered through serious illness. For a short time he acted as assistant in his father's school; but a taste for engineering began to assert itself, and in his seventeenth year he left for the railway from Kiel to Altona, then being constructed. Means were found to send him to the High School at Munich. Leaving in 1848 with an excellent *testamur*, he obtained, by the patronage of an hydraulic engineer of Hamburg, work in the preparation of plans for a contemplated ship canal between the North Sea and the Baltic, and later he had temporarily the post of superintending the dredging operations at Blankenese on the Elbe. Then his former patron nominated him to a vacant appointment as Inspector at the Hamburg Gas-Works; and, contrary to the advice of some of his friends, Schilling accepted the post, and entered on his novel duties in 1850. Rapidly mastering them, and gaining confidence in his work, he married before the close of that year. He applied himself to gain a knowledge of the technology of gas manufacture (the JOURNAL and Clegg's "Treatise" being his chief sources of information); but his desire to pass from the lighting to the manufacturing department of the Hamburg works was not conceded by the authorities. In 1856 he was commissioned to go to England to ascertain the views of experts on the laying of mains in the beds of rivers, and to observe the practice there. He then made the acquaintance of many well-known English gas engineers; and, on his return journey, he visited Belgium and Holland. He profited by the death of an inspector of long standing to improve his position; and thereafter he was able to undertake private work, and consequently became consulting engineer to many small works. On the death of a friend, he undertook, for the benefit of his widow, to provide the necessary matter for a technical column in the daily *Hamburg News;* and thus he first put his hand to journalism. He thence progressed to the scientific press—encouraged by the acceptance of an article on "Gas Lighting" by *Dingler's Polytechnische Journal*. The idea of founding a German journal of gas lighting occurred to him; and he wrote to Professor Kayser, of Munich, on the subject. At the same time, he submitted to Herr Oldenbourg (the Munich publisher) the MS. of a work on various debateable points in the technology of gas, which he purposed issuing in pamphlet form. By a happy coincidence. Professor Pettenkofer had just suggested to Oldenbourg the publication of a German gas journal; and, on the latter appealing to Professor Kayser, Schilling was proposed as Editor. On the 1st of July, 1858, the first number of our German contemporary was issued under his auspices.

Schilling undertook in May, 1859, the management of the Munich Gas-Works, which, for want of proper control, had fallen into great disorder; and for a few years this work demanded all his energies. He found time, however, to take an active part in the founding of the Association of German Gas Engineers, on the Committee of which he sat until elected an honorary member in 1876. In 1860 he published a "Handbook on Coal-Gas Lighting," which went into a second edition five years later, and was at the same time translated into French. In 1860, also, he described his modification of the effusion method for ascertaining the specific gravity of gas. His scientific attainments and literary labours received due recognition in 1865, when the University of Munich conferred on him the honorary degree of Doctor. In 1878 he published a revised edition, in French and German, of his work on coal gas. For some years he was engaged in superintending the erection of new works in the east of the town. With their completion, in October, 1883, his public labours neared their close, for the incessant toil of his life had undermined his bodily health. He sought seclusion and rest in a house he had built on the outskirts of Munich; and died—after a brief attack of inflammation of the lungs—on the 3rd of July last. Until compelled by ill-health to retire from the more active work of his profession, Dr. Schilling was one of the best known consulting gas engineers on the Continent; and to the last he retained the respect and homage of his younger colleagues.

THE CRITICAL SIDE OF ENGINEERING.

One of the most interesting of the sectional addresses delivered at the Oxford meeting of the British Association was that of Dr. Kennedy, President of the Mechanical Science Section. We have already given (*ante*, p. 375) a brief abstract of this address; but it is far too good to be passed over without such comment as may serve to bring into prominence the most instructive of the speaker's observations. It is greatly to Dr. Kennedy's credit, to begin with, that he has been able to present to the world an aspect of engineering which, though familiar enough to practising engineers, has not hitherto formed the subject of a presidential address to the members of any engineering society. This is what he calls "the critical side" of engineering; and no sooner are the words perceived than the dullest can realize the scope and the depth of the professional work they cover. One can see in an instant the force of Dr. Kennedy's definition of an engineer as "a man who is continually being called upon to make up his mind." The sentence is one of the most luminous ever written respecting the nature of engineering work; and it helps greatly towards a comprehension of the way in which such work should be done, and thus leads up to the subject of engineering training. For when we begin talking about the training of engineers—whether their speciality is to be gas, water, steam, or any other branch of the profession—the first thing is to make sure of what it is that a trained engineer is mostly expected to do, and the next to satisfy ourselves as to the way in which he can best prepare himself for his work. These are matters upon which the text-books are silent, and upon which most of us have had to inform ourselves by the tedious and wasteful methods of self-instruction. How does a man become a gas engineer, for example, if not by engaging in gas engineering—at first under the direction of some superior whose methods may or may not be a good model, and ultimately entirely upon his own responsibility? And how is a learner to distinguish bad practice from good if not by the exercise of what Dr. Kennedy refers to as the critical faculty? He is therefore to be thanked by all engineers, whether masters or students, for having stated in set terms a truth that every member of the profession has to discover sooner or later—sometimes, unhappily, too late for it to be of much service to him.

What is called the science and practice of engineering covers many things; and we suppose that there has hardly ever been a student of engineering who was not, at the outset of his career, disenchanted as to the work that fell to him to perform, by order of his superiors. Being usually what is generally described as a clever boy, either at school or as the contriver of mechanical toys, the engineering student goes into somebody's office, or into some works, only to find that there is very little of what he has learnt to regard as engineering about the routine duties which he is required to discharge. He soon learns that engineering means letter-writing, book-keeping, interviewing commercial travellers, solicitors, inventors, and a host of business people of every grade and description; and that those great designs and profound calculations that appear to constitute college and text-book engineering do not enter into the every-day work of the office. When promoted to do some drawing, the student is apt to resent rather than admire the suggestions which the head of the firm will occasionally make, with a strong hand and a very hard pencil, upon his delicately-tended paper; and when he gets out in the field, or upon some work of construction, it is more than likely that some utterly illiterate foreman ranks far above the pupil in the estimation of the responsible chief.

In course of time, however, the young engineer almost unconsciously gets to feel his feet, provided that he keeps his head. He sees somewhat of the why and the wherefore of things; and his opinions and judgments are more and more respected and deferred to by those with whom he comes in contact. Even then, unpropitious Fate may deny him those opportunities for measuring himself against difficulties presented by men and things which some lucky ones come in for; because, as Dr. Kennedy says, there are more lads entering to struggle for a share of work that is even now insufficient to go round. A man may be none the less an engineer "to the end of his nails," as the French say, although he may never have a Forth Bridge to design; and there is plenty of work to be done in the world which engineers alone can do properly, yet for which text-book learning and a thorough mastery of the higher mathematics are not required.

This work, as Dr. Kennedy points out, is largely critical. It is unnecessary to take much thought for the inventive or the creative order of engineers, who will always be forthcoming. Dr. Kennedy, with fifteen years of professional teaching behind him, declares that he does not know how a man should be trained to be an inventor, and would not tell anyone if he did. We get our Siemenses, our Maxims, our Edisons, and our Bessemers born to the work they are to do in the world; and the only care the community can take to ensure a sufficiency of such men, is by looking after sanitation and elementary education, in order that potential genuises may not be cut off untimely by preventible ills, and may be assisted in their first steps upward into light. But the ordinary man, who, without being either an inventor or a creator, has sufficient natural aptitude for, or inclination towards, things mechanical to form a basis for the trainer or educator to work on, wants the best of training, both technical and general. He must learn from his instructors all he can hold; and he must after all teach himself the most valuable portion of his knowledge.

Specialism, as Dr. Kennedy perceives but does not state in so many words, even in engineering, is more easy of acquisition than sound, general knowledge; to say nothing of wisdom, which means both knowledge and the power of using it aright. Now, an engineer who is a specialist only will fail to give satisfaction in anything beyond a subordinate office. And the smallest speciality demands some critical capacity on the part of him who would master it. Take the subject of coal carbonization, and test Dr. Kennedy's remarks on this head by it. "In almost every department of mechanical work," he says, "there are half-a-dozen ways of solving any particular problem. In some fashion or other, the engineer must be able to judge between these various methods—methods which are often very much alike, but each of which may possess certain particular advantages and certain particular drawbacks." The arithmetical form of criticism, which merely counts advantages and drawbacks, and puts an equal number of one against an equal number of the other, is common enough, but obviously useless.

The very first necessity to the engineering critic is that he should have the sense of proportion—the sense to distinguish between mere academical objections and serious practical difficulties, which will enable him to balance twenty advantages that can be enumerated on paper by one serious drawback which will exist in fact, which will enable him to pit molehills of experience against mountains of talk. It is, as Dr. Kennedy admits, perhaps a doubtful point how far this sense of proportion can be taught at all. No doubt it can only be built on some natural basis. We can all agree with Dr. Kennedy in the statement that, "in engineering we all know men whose judgment as to whether it was advisable to take a particular course we would accept implicitly, because we know that it is based on large general criticism." Great is this meed of wisdom, as the same speaker has said on another occasion, which the possession of the most undoubted technical skill does not necessarily ensure to an engineer. "Any third-year student," says Dr. Kennedy, "can criticize perfectly along certain very narrow lines, just as anyone can learn the rules of harmony, and can write something in accordance with them which purports to be music. But, after all, the music may be music only in name; and the criticism may not be worth the paper it is written upon, however formal it may appear to be, unless the writer is thoroughly imbued with a sense of the proportionate value of the different points which he makes." Just so, to use an illustration that will be familiar to our readers, any meter inspector might be trusted to criticize, in a certain way, the automatic prepayment meter system, while he could not be trusted to discuss such a system from the point of view of administrative policy. Dr. Kennedy truly remarks that "the extraordinary effect of a want of sense of proportion is nowhere better shown than in the absurd statements which are constantly made as to technical matters in public prospectuses, and the still more absurd statements made in those very numerous documents of a similar kind of which some of us see a great many, but which do not finally emerge into public view." And he might also have said that the sense of proportion is often sadly wanting when the value of the services rendered to public authorities by professional men comes to be appraised in the shape of a salary; but this would have been a digression.

The gist of the whole matter is this: Science being nothing more than organized common sense, the effective practice of any branch of engineering demands the application of knowledge of the special requirements of this department of industry and of the means of satisfying them, in accordance with the dictates of superior general intelligence. Dr. Kennedy warns mathematicians that mathematical training will not suffice alone to make a man an engineer. So the gas engineer knows that neither mathematics nor mechanical skill, to say nothing of chemical training, will serve of itself to equip a man for the proper management of a gas undertaking.

Dr. Kennedy wisely laid stress upon the danger of modern technical training, which consists in the cramming of subjects, to the neglect of matters less obviously useful. He deplores the little attention which is spared for what is more a question of literary than of technical training—the acquisition of the power of expression. "It is not easy to overrate the importance to the engineer, as to other folk, of the power of saying clearly what he means, and of saying just what he means. I do not mean only of doing this for its own sake, but because if a man cannot say or write clearly what he means, it is improbable that he can *think* clearly." No one, who has not to wade through it regularly, can appreciate the degree to which certain modern technical literature and journalism is degraded in consequence of the neglect of this branch of education. Dr. Kennedy feels the difficulty of teaching this subject; but there is really only one way of attaining to ease and felicity of literary expression, and that is by the diligent study, particularly in early life, of the works of the acknowledged masters of English prose composition, and abstention from overmuch newspaper reading. Finally, the engineer needs to be equipped for his work with a by no means small stock of knowledge of the ways of the world and of men. It is useless for a gas engineer, for

example, to know all about the working of purifiers, if he is incapable of understanding the men who are employed in this department of the works, and has no knack of "keeping in" with his directors or the members of his committee. Engineering criticism, Dr. Kennedy might have said, is quite as much concerned with men as with things; for both men and materials are combined in order to make an "undertaking." We all know men who, for all their ability, cannot get on with the people with whom they have to deal, either superiors or inferiors; and the technical expertness of such men is naught, because it cannot produce its due effect. The engineer, truly, is a man who is continually being called upon to make up his mind; but while it is the object of his technical training to enable him to do this with the smallest chance of error, it should be the purpose of his wider reading and observation of men and things to qualify himself to arrive at a right judgment in all matters, and to attain his justifiable ends with the least possible waste of power in the form of friction.

This is a big subject; but we are all students, and our thanks are due to Dr. Kennedy in no unstinted measure, for establishing a fresh standpoint from which the character of engineering work may be fruitfully studied. We may never succeed in finding a specimen of the perfect engineer in the flesh. But the observations of men of the stamp of Dr. Kennedy help to sketch out the character of this hypothetical personality; and those to whom any particular element in the combination appeals most strongly can do no harm by trying to develop it in themselves.

Proposed Ministry of Labour.—Mr. Ernest Spencer has placed on the paper of the House of Commons a notice of motion for next session for the establishment of a Ministry of Labour.

Boring for Coal in East Anglia.—The Eastern Counties Coal Boring and Development Association, which has lately been formed for the purpose indicated in the title, had a meeting at Ipswich on the 28th ult., at which the Chairman (Mr. R. C. Rapier) announced that the sum of £5000—the lowest amount with which they thought they should commence operations—had been subscribed, and borings would soon be undertaken. Considerable interest is being manifested in the enterprise, which it is believed will be attended with success.

The South-West of England District Association of Gas Managers will hold their next half-yearly meeting on the 11th inst., at Frome, when the proceedings will be to a large extent of a recreative character. The officers for the ensuing year will be elected; the names of two new members will be submitted for approval; and there will be a discussion on the subject of "Guarantees for Prepayment Meters." The Frome Iron-Works (Messrs. E. Cockey and Sons, Limited) will be inspected; and the Marquis of Bath has kindly permitted the members and their friends to visit Longleat.

Notice of Accidents Act, 1894.—In compliance with a suggestion, we have, as intimated in our advertisement columns, had a card prepared, suitable for exhibiting in gas-works, calling attention to the above Act, and placing upon all officers and workmen the duty of reporting to the Manager or his deputy all accidents of which they may be witnesses. This injunction to the employees is accompanied by the clause of the Act specifying the notice required by the Board of Trade to be sent to the Department on the occurrence of any accident causing personal injury or loss of life.

Gas Consumption on the Continent.—According to some statistics lately collected by the Berlin Corporation relative to the consumption of gas in 28 German towns, as well as in Stockholm and Copenhagen, Berlin stands fourth on the list in regard to the general consumption of gas—the three towns before it being Carlsruhe, Cologne, and Charlottenburg. In Berlin, the consumption of gas per head is 83 cubic metres (2930 cubic feet); the quantity used for private lighting being 69 cubic metres—the highest figure in the list. With regard to the consumption for heating, cooking, and industrial purposes, Berlin stands lower; the figure being 6·4 cubic metres per individual, against about 11 for Bochum and Düsseldorff, 14 for Carlsruhe, and 26 for Copenhagen. As to price, Berlin is sixth; the charge being equal to 4s. 6d. per 1000 cubic feet. The prices for the other towns range between 6s. and 3s. 8d., in addition to which the largest consumers in some towns are allowed a reduction.

Pye's Coke Screening and Sorting Machine.—During the past fortnight, a number of gas engineers and managers, and others interested in the coke and breeze trade, have been inspecting, under practical working conditions, a new mechanical screen, the invention of Mr. T. E. Pye, of Shrewsbury, and known as the "Economizer Breeze-Screen." This screen, which was described and illustrated in the JOURNAL for June 6, 1893 (p. 1043), is the property of the Shrewsbury Gas Company, who have been for the past two years working the patent. It is now being manufactured for use in gas-works in the recovery of breeze and small coke from ordinary coke and furnace refuse; the invention being applicable to all classes of screening, as for coal, cement, macadam, concrete, &c., although the manufacturers are for the present confining their attention to the first-named purpose. It can also be used in connection with coke-conveying systems, under coke-breakers, &c., as it will deal with large quantities of material.

NOTES.

A Galvanoplastic Method for Protecting Iron and Steel from Rust.

Perhaps the most extensive experiment in regard to the protection of an iron and steel structure from rust by any process other than painting is in the case of the tower of the new City Hall of Philadelphia, now in process of erection and nearly completed. This work is being carried out by the Tacony Iron and Metal Company. It is a double process; the object of the first stage being the protection of the metal from rust by electroplating it with copper to a weight of 14 oz. per square foot of surface, and the finish being an electroplate coat of an alloy of aluminium and tin weighing 2½ oz. per square foot—the purpose of this being to give colour, and also to prevent oxidation of the copper into a green skin of verdigris. The plan was adopted in preference to paint, on the score that the periodical renewals of the latter would cost $10,000 per annum. The total weight of wrought and cast iron to be protected is about 500 tons, extending to 100,000 square feet of surface; the largest single pieces being sixteen columns 27 feet long and 3 feet in diameter, weighing 10,000 lbs. each. These columns received the copper coating inside as well as outside. The outside coating, being more exposed, is put on in two layers, while the aluminium treatment comes last as a protective coating to all beneath it. The entire cost of the process varies from 40 c. to $1 per square foot—depending upon the shape of the piece. The principal expense is for cleaning; the greatest care being required to ensure good work. The metal has to be boiled in a strong solution of caustic soda, then washed, and again pickled in dilute sulphuric acid, and afterwards scrubbed with steel-wire brushes and water. This is, in effect, an attempt to remove the reproach of perishableness from structural iron and steel, and to make these materials last for ever without further protectionary measures of any kind.

Pupilometry and Photometry.

The connection between photometrical observations and those of the effect of light upon the human iris has recently been studied by M. Charles Henry. The automatic adjustment of the iris to the amount of light falling upon it is a matter of great interest in connection with artificial lighting arrangements, inasmuch as the efficiency of the eye, and consequently of any system of lighting, is directly dependent upon the surface of the pupil exposed to the action of the light-rays. An attempt has been made to construct a photometrical instrument which should operate upon the principle that equal lights produce equal dilatation of the iris. In an appliance of this kind due to Mr. Gorham, the phenomenon of irradiation was utilized; the principle being that when two luminous points, the line joining which is perpendicular to the axis of vision, produce on the retina two circles of irradiation which just touch each other, the distance between the points is equal to the diameter of the pupil. The assumption upon which the accuracy of this instrument as a photometer depends is, however, doubtful, as the degree of contraction of the pupil does not altogether depend on the intensity of the illumination, nor are all eyes equally sensitive to light. Actual measurements of the diameter of the pupil of the eye have very rarely been made. Lambert gave a few measurements and conclusions founded upon them in his book on photometry published during the last century. The most important of these conclusions is that, if the eye is exposed to different degrees of illumination, the area of the pupil exposed does not vary inversely as the illumination, but in such a manner that the product of the illumination and the area exposed becomes gradually less the feebler the illumination. M. Charles Henry is trying to repeat these experimental results of Lambert, with better and more reliable apparatus. The importance of research in this direction is obvious; for deductions drawn by photometrists respecting the illuminating effect of lights from which their eyes are carefully screened, are still, for want of definite scientific pronouncement upon the subject, confounded with the impression produced upon eyes which see at the same time both the source of light and its effect; so that it is taken for granted that photometrical indications constitute a measure of lighting values.

An Air-Lift for Fluids.

An interesting novelty in the way of pumps for water, acids, oils, and corrosive liquids of any kind, as well as for fluids containing foreign matters that would be destructive to valves and other working parts, is the Pohlé air-lift device recently introduced into this country. The apparatus consists merely of a pipe with a bell-mouth at the bottom, which is lowered into the liquid intended to be raised, and another pipe for compressed air, the bottom of which is turned up in a semicircle so as to hook under the bell-mouth of the large pipe. When air is forced through this second pipe, it escapes into the larger; and by reducing the specific gravity of the whole column of contained liquid, it forces it to rise. Considerable heights may be commanded in this way; and it is claimed that the total mechanical efficiency of the system is, as a rule, over 80 per cent., while it sometimes attains to 90 per cent. The advantage of such a means of lifting tar, ammoniacal liquor in gas-works, acid, &c., is obvious, if no countervailing consideration can be suggested.

As the entire mechanism of this system of raising liquids is independent of the situation of the compression machinery, the latter can be fixed in any convenient place, and the air conducted in pipes to wherever it is required. The ease with which, by such an arrangement, fluids can be raised from different levels of the several containing receptacles is not the least of its recommendations.

The Influence of One Substance on the Spectrum of Another.

A curious observation as to the influence of one substance upon the spectrum of another in the flame of a burning body has been made by Professor Hartley, F.R.S. He remarks that, in the oxy-hydrogen flame, the water-vapour lines are prominent; but that only two groups are visible in the spectrum under normal conditions, and with an exposure of half an hour. If, however, some sulphur is burnt in the flame—the conditions being otherwise unchanged—the spectrum, in addition to a band of continuous rays and floatings characteristic of sulphur vapour, shows the water-vapour lines wonderfully strong, with groups extending beyond the portions of the spectrum usually photographed; and not only are these lines distinct, they are also dense, as if their radiating power or the chemical action of their radiations were greatly increased. This does not arise from the continuous spectrum merely overlapping and apparently strengthening the water-vapour lines, since new groups of lines came into view which were too feeble to be visible on the other photographs. Sulphur is not the only substance which affects this spectrum; for instance, the banded spectrum of magnesia and the spectrum of lime also appear to intensify it. It is considered probable that something similar takes place with regard to carbon.

COMMUNICATED ARTICLE.

STOKERS AND POKERS.

By Thomas Newbigging.

The heading of my communication will be clear enough with a word of explanation. A good many years ago—in 1849, I believe—a work was published under the title which I have adopted. The book in question was, so far as I remember, a kind of history of the constitution and administration of a line of railway from its humblest workers upwards. My definition of "Pokers" is not that of the author of the work named. The pokers to whom I refer, instead of poking the usual kind of fire to make it burn brightly, exert themselves in stirring up strife between employers and employed; causing the fires of enmity and spite and hate to glow and burn with all but unquenchable fierceness. There is also another class of pokers—philanthropical and emotional pokers—who may be described as poking their noses into other people's business; whether it may be the business of the workmen or their employers, or of both. So much by way of preface.

The employees of gas-works may be conveniently divided into four classes—viz., (1) skilled workmen, (2) stokers, (3) labourers, and (4) the official class, such as engineers and managers, secretaries, chemists, clerks, foremen, storekeepers, meter inspectors, and collectors.

I estimate that in the United Kingdom there are employed in, or in immediate connection with, gas-works belonging to local authorities, statutory and non-statutory companies, and private individuals and firms, about 68,000 persons altogether, classified as follows:—

10,000 *Skilled Workmen*.—These consist of brick and retort setters, blacksmiths, engine tenters, main and service layers, meter makers and repairers, and fitters.

23,000 *Stokers*.—These may be described as a higher class of labourers, or as semi-skilled workmen, employed in retort charging and drawing, and furnace men.

26,000 *Labourers*.—These comprise coal and coke wheelers, men employed in the purifying-house, in the yard, and in outdoor work, assisting the main and service layers and fitters, including also the lamplighters.

9,000 *Officials*.—These are the engineers, managers, secretaries, and others.

The total amount paid as wages and salaries in gas undertakings in the United Kingdom may be set down at about £5,000,000 per annum, distributed as follows:—

Among the	10,000 skilled workmen	£832,000
,,	23,000 stokers	1,598,000
,,	26,000 labourers	1,270,000
,,	9,000 officials	1,300,000*
Total.	68,000	£5,000,000

This expenditure as wages is not all on revenue account; for a portion is for capital purposes. The average per man seems to work out at a somewhat low figure; but it must be remembered that the proportion of labourers is large, and neither these nor the stokers are all constantly employed.

The skilled workmen receive, on an average, 32s. per week.
,, stokers ,, ,, 35s. ,,
,, labourers (men and youths) ,, 21s. ,,

The skilled workmen and labourers work 54½ hours per week, and the stokers nominally 56 to 78 hours—depending upon whether they are on eight or twelve hour shifts. At some gas-works, labour on Sundays is largely reduced.

The officials and the skilled workmen are kept employed all the year round. The number of stokers at work necessarily varies from month to month; but a considerable proportion are employed all the year at their proper work of carbonizing.

When the heavy lighting season is over—say, about the middle of March—many of the stokers are employed at their respective gas-works during the intervening months, to about the middle of September (when the heavy lighting season begins) in main and service pipe laying, on general repairs, and in painting the gasholders, the roofs of buildings, and other iron-work. Recently, Mr. Frank Livesey, the Engineer of the South Metropolitan Gas Company, instead of dispensing with his disengaged stokers at the end of the season, employed the whole of them during summer in the excavating and concreting work required in the construction of a huge gasholder tank. In this way, their services were retained all the year round without a break.

In summer, such of the stokers and labourers as are not kept on at the gas-works, go labouring elsewhere—some for bricklayers and masons; others find employment on steam vessels as stokers and even as sailors; and in the later season many of them go harvesting. It may be said that, as a general rule, a gas manager endeavours to retain good men in his employ during the whole year. In any case, stokers, if they have been working away, are usually only too glad to get back to the gas-works on the approach of winter.

The stokers' hours of labour—actual labour—are comparatively short, though it may appear to the uninitiated that men on twelve-hour shifts have long hours. The long hours, however, are only apparently so; the actual hours of labour per day being not many in reality. The idea which is entertained by the outside public as to the long and severe twelve hours' labour of gas stokers needs to be corrected. Mr. W. W. Hutchinson, of Barnsley, from careful observation, found that a stoker on a twelve-hour shift is actually on the gas-works premises not more than 10¼ hours, of which, for 4 hours 39 minutes he is engaged on the most arduous part of his work, and 1 hour 44 minutes on light work, such as any strong lad could perform. This gives a total work of 6 hours 23 minutes; and the remaining 4 hours 7 minutes are spent in rest and at meals. Hence it is seen that the stokers work fewer hours a day than almost any other class of labourers. I am not now arguing in favour of twelve-hour shifts, but simply stating facts.

The work of stoking is by no means so laborious and continuous as has been represented. A dock labourer's work, for example, is both harder and more incessant, and worse paid. So is that of a coal miner. Neither of these has the same comfortable quarters in which to do his work; neither are the sanitary conditions and environments anything equal to those enjoyed by the stoker. Certainly, there is exposure to great heat during charging and drawing by hand; but a steady man thrives and grows strong in face of it. The ventilation of a retort-house is generally excellent—far superior to that of the stoke-hole of a steam vessel, or even to that of a coal pit. There is abundance of fresh air, and usually plenty of clean water at the service of the men employed in a retort-house. The work is not of a dangerous kind. When ordinary care is exercised, it is a rare thing for a stoker to be injured in following his daily occupation.

The labour of stokers cannot be considered as skilled labour in the proper and usual sense of that term. True, some modicum of skill is required in the handling of a shovel, a scoop, and a rake; but a fortnight's practice enables an ordinary intelligent labourer to perform the work of a gas stoker efficiently. This has been proved over and over again.

Gas-works stokers have this important advantage on their side, on which emphasis should be laid: They have good, steady, secure, and well-paid employment during the whole winter; whereas many skilled tradesmen—such as masons and bricklayers especially, and to some extent joiners and house painters, and the vast army of ordinary labourers—have to live often for many weeks together, when the weather is severe, in enforced idleness, with no wages coming in at the week-end. By severe weather, I mean unfavourable weather, such as during frost, snow, and rain. At such times, outdoor work is largely at a standstill.

In many gas-works, the stokers have a room provided, where they can take their meals in comfort, and sit and read the newspapers; and in some instances baths are set apart for their use. I speak advisedly when I assert that, looking at the whole of the facts dispassionately, it may be said, without exaggeration, that gas-works stokers are the aristocracy among labourers.

The Manchester and Salford gas strikes of 1890-91 were deeply discreditable to those who instigated them; and the lesson taught by them should not be forgotten. The men had had conceded to them all they asked for, both in regard to wages and hours of labour; but, not content with this, they wanted to dictate to the Gas Committees what hands they should employ. They tried to oust certain non-union men; and because the demand for the dismissal of these men was refused, they struck work. The Salford stokers, it was admitted, had no grievance at all; but they came out bodily, at the call of their

* This includes directors' and auditors' fees, collectors' commission, &c.

advisers, to support their Manchester mates. The leaders of the men lost their heads—if ever they had any; being inflated with the success of their agitation in the matter of hours and wages. They did not deserve the title of leaders—misleaders would better describe their action. There is not a stoker in Manchester and Salford to-day who would not agree with what I now state.

In the interests of the men themselves, and in the interests of labour and labourers throughout the kingdom, it was fortunate that the leaders and their dupes were ignominiously defeated. It was not a question as to whether Trade Unionism was or was not a good and desirable thing. Most or all of us sympathize with workmen in their laudable efforts to better their condition by unity of purpose and action. The question was whether it was right to use brute force to compel, and be permitted to succeed in compelling, workmen on the one hand and employers on the other, to submit to the arbitrary decrees of a tyrannous conclave, who were prepared to crush freedom of action and freedom of contract on the part of employed and employers; and this, observe, after the reasonable demands of the men had been already complied with.

I am of opinion that a rise in the wages of gas men generally would have taken place in the prosperous years of 1890-91, even if there had not been any agitation. The feeling among gas engineers and managers was that the workmen ought to share in the general prosperity. The strikes that took place, or most of them, were not on the question of wages or hours, but rather on that of the employment of non-union hands, and an attempt to dictate to employers what men they should employ.

As to the remedies for strikes, I suggest: (1) Sweet reasonableness on the part of both employers and employed. (2) Wise leaders of the men; failing that, (3) bitter experience on the part of the men of the work of unwise leaders. A good cause calculated to win public sympathy will shorten a strike when it occurs; and the side that deserves that sympathy will win. (4) The introduction of machinery for economizing labour. (5) Habits of thrift in workmen. (6) Fewer facilities for drinking—which weakness makes men reckless and improvident. (7) The education of workmen's wives and daughters in domestic economy and cleanliness in the home. (8) Profit-sharing, where it can be applied.

Mr. George Livesey would probably place the latter first. I should be inclined to place it about midway, if it were universally applicable. But, as a remedy, profit-sharing has its limitations, even where it can be applied. "Man shall not live by bread alone." Again, it cannot be adopted by local authorities, some of whom do not make profit (or but little) beyond paying the interest on capital, and providing a sinking fund to redeem capital. It will answer better in some places than in others. In certain large towns, for example, it would do, where there is the possibility, by reason of the constantly growing gas consumption, of making large profits; but in many less favoured places it is only possible to earn the bare statutory dividends without unduly raising the price of the gas.

I do not agree with voluntary or extemporised outside interference, whether as intermediaries or otherwise, between masters and men, unless both sides desire to submit their case to such umpirage, and agree to abide by its decision. It otherwise does more mischief than good. A quiet talk and discussion of grievances between the contending parties would sooner lead to a settlement of disputes and differences than any interposition of persons ignorant of the conditions, and swayed by emotional influences, rather than by knowledge and reason. Unfortunately, a false pride on the part of both the disputants generally prevents this desirable *rapprochement*. If this mistaken pride could be removed, and a reasonable mind substituted for it, strikes, when they occurred, would be of short duration. I fear, however, that so long as human nature remains what it is, nothing will prevent occasional strikes; but that their number and severity can and will be minimized, I have no manner of doubt.

Electrolysis of Water-Pipes.—Owing to the trouble caused in Newark (N.J.) through electrolysis of water-pipes, the Board of Aldermen have passed a resolution calling upon the Consolidated Traction Company to detach all ground wires connected with any water-pipe underground, and holding them responsible for all damages that may ensue from making these attachments.

Explosions from Coal Dust in Mines.—The report of the Royal Commission on Explosions from Coal Dust in Mines has lately been issued. The following are the conclusions arrived at: (1) The danger of explosion in a mine in which gas exists, even in very small quantities, is greatly increased by the presence of coal dust. (2) A gas explosion in a fiery mine may be intensified and carried on indefinitely by coal dust raised by the explosion itself. (3) Coal dust alone, without the presence of any gas at all, may cause a dangerous explosion if ignited by a blown-out shot or other violent inflammation; but, to produce such a result, the conditions must be exceptional, and are only likely to be produced on rare occasions. (4) Different dusts are inflammable, and consequently dangerous in varying degrees; but it cannot be said with absolute certainty that any dust is entirely free from risk. (5) There appears to be no probability that a dangerous explosion of coal dust alone could ever be produced in a mine by a naked light or ordinary flame.

TECHNICAL RECORD.

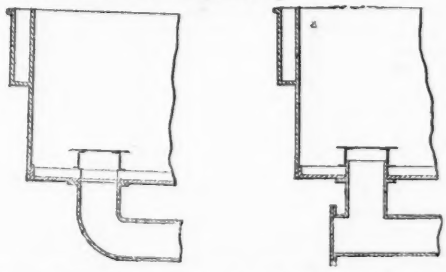
NORTH OF IRELAND ASSOCIATION OF GAS MANAGERS.

The Annual Meeting in Armagh.

At the close of the remarks on the papers read at the above meeting, as given in the JOURNAL last week, the following discussion took place on

EXPERIENCES IN PURIFICATION.

Mr. G. R. LOVE (Dundalk) said their Secretary had been most anxious that he should give a paper at this meeting; but he found that he was not capable of attempting the lofty matter of reading one. He thought also, from past experience, that they would get far more information from a conversational discussion than from a set paper. So, to get out of the difficulty, he agreed to start a conversation on "Purifiers and their Difficulties;" and he hoped the members would see their way to enter very largely into the conversation. They had all had their troubles from time to time. Perhaps the most general trouble they had had in connection with their purifiers was complaint from their near neighbours about smells. He had not been exempt from this complaint; and he endeavoured to seek out a means of reducing the smell to a minimum, so as to please his neighbours. They were pretty closely packed together at Dundalk; and when he took off the cover of a purifier, the smell affected a number of people. Last year he noticed that a gentleman read a paper on the use of air with lime purifiers. He (Mr. Love) tried it on a small scale; and it had proved to be of considerable advantage. He fixed up an arrangement which gave him about 1½ to 2 per cent. of air into his lime purifier; and he found that, by this means, he extended the life of the lime to nearly double what it was before, and further that he was able to bring out the lime nearly as white as when he put it in. This autumn he was making alterations on his works; and the arrangement was consequently out of operation just now. But he was again going to use it in a more elaborate way later on. On putting it off, he found that the old nuisance—a very heavy smell—returned. Once he allowed the cover to remain on for about a fortnight after the purifier had been in use; and when he took it off, there was a most fearful smell, and the complaints again cropped up. He had trouble of another kind last year and the year before. He ought to mention in advance that he used oxide of iron in one of his purifiers; and that he had a battery condenser at the works, which sometimes got out of condition. In order to make it right, he had to apply a jet of steam to the connections. His men one day, when they put on the steam, found a choke; and they thought that, by turning on more steam, they would remove it. But when he came in, he found that there was a complete stoppage of the pipe—the steam had become entirely absorbed with the oxide, and had formed in the bottom of the purifier a kind of silt, which had run down into the inlet-pipe. The pipe being perfectly straight, there were no means of taking out the silt. Fortunately, however, he had an empty purifier; and he turned on the gas to it, had the stopped one shut off, and drilled a large hole in the bend, and in this way was able to get the sludge taken out. But he found considerable trouble in doing this; and he was also in terror lest the dirty gas should go forward to the town. When he had time, he placed a malleable iron cover on the top of the inlet-pipe, which prevented the sludge getting into it; and he put a cleaning-out bonnet on the bend, below the purifier. [Mr. Love showed a sketch of the arrangement of his purifier-inlet, as it was originally arranged, and as it had been altered to obviate the trouble to which he had referred.]



Mr. W. B. FEATHERSTONE (London) said that the suggestion Mr. Love had made he had carried out with purifiers a short time ago. He thought it was chiefly a matter of temperature.

Mr. P. J. SALMON (Galway) said he had had some difficulty in the matter of purification; but in his case the gas went into the side of the purifier-box—about 4 inches above the bottom. He thought it was much better that the inlets should be placed at the side.

Mr. J. WHIMSTER (Armagh) said that, not to be behind, he had looked up his own experience; but the points he had noted down did not exactly run in the same direction as those to which Mr. Love had referred. The first thing he had noted was as to the area of their purifiers. He did not know how they were all situated with respect to this; but his purification area was much too small—at all events, according to the orthodox

rules. He thought the proper rule was to have about 10 square feet to every 1000 cubic feet of gas made per 24 hours. In his case, this would mean an area of 1200 square feet; whereas he had only a grid-area of 576 square feet. He felt this condition very keenly a while ago; though he did not feel it so much now. Why? It was the change he had made in the coal carbonized. With Lancashire coal, he felt the insufficiency of his purifiers extremely. But, for several reasons, he turned to Scotch coal; and he was relieved at once. A round of his purifiers, which used to purify 800,000 cubic feet, now purified 2,000,000 cubic feet with the same grid-area. In his purifiers, the gas entered at the top; and the foul gas, entering at the top, destroyed the covers. This was an awful nuisance; but there was no changing it. He found that a great deal depended upon the condition of the lime when it was first of all put into the purifiers. He was in the habit now of having his lime slaked for from three to six months before he wanted to use it; and just as the men had any spare time, he sent them to turn it over and water it. In this way, the lime was kept thoroughly cool, and in perfect condition; and it would purify 25 per cent. more gas than freshly slaked lime. To get the gas thoroughly purified, he found that great attention was necessary in the cleaning of everything—including the purifiers, the grids, the centre-valve, and the connections. If these were not kept clean, they would have any amount of difficulty. He always arranged to clean them all thoroughly twice a year; though sometimes now—seeing that the purifiers took more than twice the quantity of gas—he dispensed with the summer cleaning, and did it in winter. He found, however, that, although the centre-valve was clean, if the pipes were not it was a mistake, because the clean gas passed through these pipes as well as the foul. He once found the gas clean at the inlet of the last purifier, and dirty half-way between the purifier and the meter, simply through the gas being passed through foul pipes. It was also necessary to see that the grids were clean. He had had one experience of this, in a purifier refusing to take gas simply through the grids not being thoroughly cleaned. But when they changed the lime, and cleaned the grids, everything went smoothly. Another thing he had found of great importance was the temperature at the outlet of the condensers. If the temperature there was too low, it was hardly possible to purify the gas. He once had this difficulty; and, on taking the temperature at the outlet of the condensers (which, through some means, they had neglected to look at), he found that the temperature was down to 30°. He immediately bye-passed the condensers, so as to get the temperature up to 65°; and they were then all right. Another thing that he found acted in something like the same way Mr. Love spoke about as the result of the admission of air. He thought it was a bad thing to change a purifier too soon. He supposed they were all in the habit of testing their gas at the inlet of the last purifier; and, as a rule, the purifier was changed if it showed foul there. In his experience, this was too soon to change it. If they changed whenever the gas showed foul there, then, unless they had plenty of boxes, there was a danger of running round the purifiers until the clean lime received the carbonic acid; and then the gas would not be purified at all. When his gas was foul at the inlet to the last purifier, he let it run sufficiently long to have it thus about half way through. In this way, the sulphuretted hydrogen was driven forward, and the lime was carbonated; so that, when taken out, it was so white that the men had frequently asked him to come and see it, as they said the purifier was not dirty. He (Mr. Whimster) had seen small gas-works, with only one or two purifiers, where one would think they had a large stock of clean lime, until told that it had been all through the purifiers; and yet they could not purify the gas. The reason for this was that the lime was carbonated at once; and it would not then take the sulphuretted hydrogen. The simple cure for this was to fill the purifier with clean lime except the first tray, on which was put foul lime. This received the carbonic acid, and then the clean lime took up the sulphuretted hydrogen. Afterwards, in changing, the last grid was put in as the first grid, and this kept matters right. He always slaked the lime with water as soon as it came into the yard; never allowing it to get air-slaked.

Mr. W. Miller (Cookstown) said that about two years ago he had been obliged to change three purifiers in a week—purifiers 6 feet square. Various ideas came into his head as to why this was necessary. He suspected the centre-valve to be short-circuited—to speak in electrical language; that, not being sufficiently tight, the gas was getting into a dirty chamber. He found that he was right in some respects; the men were working the lime far too wet into the purifier, and it blew into balls like small potatoes. He then made the lime so wet that, when lifted, it would make like a ball of snow and then break again. The result was that his lime bill in a year fell from £16 to about £4—that was with the same coal. But since he changed to Scotch caking coal, his lime bill was even £1 less. With regard to air for the purifiers, he had rigged up an arrangement with an old testing-meter. He drilled a hole at the inlet of the exhauster, and attached a pipe from that, so as to regulate the air supply to from 1½ to 2 per cent. He found that, by this means, the purifier lasted a good deal longer; but his exhauster soon stuck. His experience was that the air process would not work unless by passing the gas back.

Mr. R. Ross (Dungannon) asked if Mr. Salmon only saved £1 a year by using Scotch coal. He (Mr. Ross) saved just about one-half his former outlay for lime. All those who used Scotch coal would coincide with him that, if they did not save about one-half, it was not worth using.

Mr. Frizelle said he had tried the air process also; but he did not get the results that Mr. Love had. His experience was the same as Mr. Whimster's. With Scotch coal, he had made double. This was his first year's experience with Scotch coal. Like Mr. Whimster, he had his lime delivered in summer, and had it slaked and packed up; and he found that he had no difficulty except that, when he used Lancashire coal, he had a purifier open very often in mid-winter. At the present time, he thought it was a month since he had had a purifier open.

Mr. Miller remarked that he laboured under the difficulty of having far too much condensing power. He fitted a pair of thermometers, one on the inlet and the other on the outlet of his purifier; and he found that the gas was below 40°. The purifiers suddenly became quite inert; so he bye-passed the condensers (they were vertical ones) and lowered the water, and this cured the difficulty.

Mr. Love asked if Mr. Miller tested for carbonic acid in the lime, because there was a percentage of carbonic acid in the atmosphere; and if they allowed the lime to lie in the open for months, they were bound to have a considerable quantity of carbonic acid in it.

Mr. Miller said he tested it, and there was a small quantity; but it did no injury.

Mr. J. Dewar (Newtownards) was sorry to say that, coming from the same quarter as Mr. Love, their ideas were diametrically opposed. To begin with, he (Mr. Dewar) thought that people had the idea that purification began and ended with the purifiers, which was cutting the matter much too short. From the very first moment when condensation began, after leaving the hydraulic main, he held that purification commenced; that was the removal of materials that had to be removed and leaving the materials which should remain. The sending of the gas into the scrubbers and washers was a method of liquid purification; and a great deal more could be done, he believed, in purifying gas by the substances that were present in the coal. Sulphur, for instance, could be removed by treatment with strong ammoniacal liquor. If air purification were to be carried on, the air certainly should be introduced at the beginning of the condensing appliances, so as to give the air a chance of becoming carburetted, and thus minimize the diluting effect of the nitrogen it contained. But regarding air purification with lime, he thought it was not at all a recognized process; and he would certainly not believe in it himself, because, when using oxide of iron, as Mr. Love did, how did he know whether it was purification by oxygen and air, or purification by oxide of iron? In purifying by lime alone—and he was sorry to say that he had not suitable purifying apparatus—he took as much care as possible to get the lime as fresh from the kilns as possible; and he slaked and put it into the purifier as soon as possible after its delivery. The leaving of the lime unslaked was a very interesting question. He knew that in testing liquor with lime perfectly air-slaked and converted into calcium carbonate, which was used for freeing the compounds in the liquor, the result was an appreciable rise in the percentage of ammonia in the waste liquor. He discovered this fact on account of the lime having been air-slaked, and not acting in its proper capacity. In purifying with lime and oxide of iron, they had matters all their own way; and he thought they should be very thankful to get oxide of iron, and have proper accommodation for it. If they freed the gas from ammonia by lime converted into calcium carbonate, of course there would be some sulphur compounds left; and they could not carry that to the oxide of iron. But if their calcium carbonate showed in a white condition, he saw no reason why they should not revivify the lime, and use it over and over again. This would not require very large apparatus. It would merely be necessary to apply heat in any way, and the thing was done. He did not think that this question had been worked up as it might be. With regard to the gas entering the purifier from the top, he certainly thought it was very much better to have it entering in this way.

Mr. Love said that Mr. Dewar had quite misunderstood him; he used the air with the lime alone. He said that last year he used it with oxide and lime, but not now; and that he put the air in at the inlet of the condensers, and not at the purifiers.

The President said there was one matter Mr. Love mentioned, and that was the reduction of the smell. This should be the aim of every gas manager. In his own case, he used inlets placed at the side of the purifiers, and the foul gas entered at the top—the outlets being taken off at the other side. Mr. Whimster had stated that he stored his lime for about six months before using it. One of the chief objects of using lime was, however, to remove carbonic acid; and he (the President) thought that, if they exposed lime to the atmosphere for such a length of time, and turned it over (which all meant exposing a fresh surface to the atmosphere), the quality of the lime for extracting the carbonic acid impurity would be deteriorated.

Mr. Whimster: If it does deteriorate, it purifies 25 per cent. better.

The President said he did not admit that. Mr. Dewar seemed to put his lime into the purifier much too soon. He (the speaker) should imagine that if they slaked it for about a week, and allowed the lime to be perfectly cool, they would get better results than either Mr. Dewar or Mr. Whimster had

mentioned. One remark had been made about the temperature at the outlet of the condensers—a most important item; and he supposed they did not need to be told that the chief reason of the apparent, or of the actual fouling of the purifier, on account of the reduction of temperature, was due to the dissociation of the carbonic acid from the carbonate of ammonia in the scrubber, and that, in its turn, it displaced the sulphuretted hydrogen in the first lime purifier, and decomposed the calcium sulphide. The maintenance of the temperature to about 60° Fahr. was thus very desirable. One gentleman remarked about the hardening of the exhauster, and ascribed it to the use of air. He (the President) could not at all see how this could be. He imagined the gentleman had a sort of pitch forming. He thought it was rather due to bad lubrication; and he might say that, in his own case, he lubricated with common creosote oil. He found that this oil, mixed with tar, made a very convenient lubricant. Neither by itself was sufficient; but the mixture was very good. He used a combination of six or else twelve purifiers—the first four of each series worked by a centre-valve. The arrangement permitted three or four boxes to work in series; and the ordinary four-way plugs allowed either of them to work singly or together. So that, with the exception of the period when one was being changed, the whole series were at work at one time. He thought that this was a system of valving which was better than the valve which permitted only of having three purifiers at work at one time. He used four purifiers with lime and oxide of iron diagonally; and the other two of the six (which came last), with oxide of iron. There was always one box with foul lime; and he should remark, at the same time, that he used 1½ per cent. of air. He found that the admission of this quantity of air completely revivified the oxide in the two diagonal purifiers; and that the carbonic acid which might happen to escape the one lime box was readily taken up by the other. The test for changing was the appearance of carbonic acid at the outlet of the last box of the four. When they renewed the foul lime, they made the second lime box, which had been third of the series, the first. After renewing the lime, the box which had been first before was made third; and so the process of re-oxidation of the oxide of iron therefore went on continuously. The effect was that he very seldom changed a purifier; at the present time he only did so about once a month. The two oxide of iron purifiers which were the last of the series had not been changed for nine months; and the two oxide boxes which were diagonal with the two lime boxes had not been changed since Christmas. Before that they had been in use for about eighteen months; and the oxide, when taken out, met with a very ready sale. The result had been that he had reduced the cost of purification during the past two years to a shade over one-fourth the cost during previous years. He always worked with two lime and four oxide purifiers as he had described. He was speaking of ordinary coal gas—not oil gas; and they had a make of about 20 million cubic feet. It was said that the means for purification did not exist during the period of changing the one lime purifier; but that was only a short time compared with the weeks the boxes were in action in that way. He had no difficulty whatever in revivifying the oxide; but, of course, he was telling them of this as a means for dispensing with the smell that Mr. Love said was complained of.

Mr. Ross: With oxide of iron, of course, you have not the smell that you have with lime alone.

The President: That is true; but the result of the combination, I think, has been a very considerable economy as well. He mentioned that the spent lime was used, mixed with ordinary, fresh-slaked lime, for luting purposes; and it was quite efficient.

Mr. Williamson: Did you make any change in coal?

The President said he did make a change; but he could assure the members that the economy could not be entirely ascribed to that. They changed to the Scotch coal; and this Scotch coal appeared to be either not so fully charged with impurities, or did not give off so many, as some of the Newcastle and other coals they formerly used. In the case of the oxide, they used two layers, 18 inches deep, without any appreciable pack; and the grids on which the oxide rested were made of shallow cast-iron, about ⅛ inch thick, and, of course, no absorption of moisture took place as with wooden grids. The size of his purifiers was 12 ft. 6 in. square.

THE GAS INDUSTRY IN THE UNITED STATES.

By Herr W. von Oechelhaeuser, of Dessau,
General Director of the German Continental Gas Company.

A Lecture delivered at the Meeting of the German Association of Gas and Water Engineers at Carlsruhe, June, 1894.

(*Concluded from p.* 429.)

Now if I may be permitted, in conclusion, to make a few general remarks concerning the outward aspect of the American gas industry, I would say that, from what I have been able to gather, the position of that industry is as secure and as promising there as it is in any of the European States. This is the more remarkable, and the more creditable to America, since the coal-gas industry in that country has to keep up a keen competition with the kindred industries producing natural gas, mineral oil, and electric light. A circumstance which is characteristic of the New World, however, where generally speaking, industrial works assume such gigantic proportions, is that there can neither be found gas-works so large as in England nor electric central stations so extensive and beautiful as in Germany. The main reason of this is probably the fact that a number of rival gas and electric companies are generally to be found at the same place; while with us and in England, from considerations of public convenience, and on account of the existing condition of the thoroughfares, the usual thing is for one company—or, indeed, for the municipal authority—to monopolize the whole gas or electric supply of the place.

In regard to electric central stations, one main cause, in addition to the circumstances above mentioned, prevents these establishments from assuming gigantic proportions in America, and that is the competition into which such central works have to enter with the many existing private installations, or what might be called an intra-industrial competition, owing to which establishments that would otherwise be among the largest and most desirable consumers of electricity—such as the big hotels, the enormous buildings occupied by offices or shops, the theatres, &c.—must be once and for all omitted from the list of probable patrons. As to private residences in America, they have not, up to now, been supplied with electric light from a central station to an appreciably greater extent than with us.

Thus it will be seen that, so far as electric lighting goes, the customary American system of doing things on a grand scale is displayed, not so much in the central as in the local private installations. Those who wish to obtain further particulars regarding this point may refer to the valuable material, accompanied by diagrams and a profusion of details, which is given in those hurried, and yet so wonderfully complete reports, sent in by Messrs. Riedler, Reichel, and Gutermuth to the *Journal of the Association of German Engineers*, and containing a vast deal of interesting information and excellent criticism. To mention but one example of such local or private installations carried out on a truly colossal scale, I will take the new lighting and heating plant fitted up at the Auditorium Hotel at Chicago, which is arranged for as many as 20,000 incandescent lamps, and has 1750-horse power at its command—in fact, the installation in question is very nearly equal in extent to the Düsseldorf electric works; and I may add by the way that, in the selection of dynamos, Siemens and Halske dynamos were adopted in preference to American machines.

I also feel that I must not omit to refer to a question which, since my return, has been frequently addressed to me by both experts and laymen—viz., What is the position of American gas-works in regard to their dividends? Are those still capable of competing with electricity developed in that country to such a high degree? A clear and concise answer to this question will be found in the following table:—

TABLE *showing the Average Profits realized by the Gas and Electric Works in the State of Massachusetts.*

[Area, 21,000 square kilometres; population, 2¾ million, or 104 inhabitants per square kilometre (Germany has 91·4 inhabitants per square kilometre); capital, Boston 450,000 inhabitants.]

—	Years.	Number of Companies whose Financial Status appears in the Returns.	Number of Companies by whom no Dividends have been Paid.	Maximum Dividends Paid. Per Cent.	Average Dividends (*all* Companies included). Per Cent.
Companies supplying Gas only.	1886(1)	62	10	36	7·58
	1887	64	11	22	6·97
	1888	64	12	20	6·86
	1889	61	11	20	6·92
	1890	48	13	20	5·82
	1892(2)	45	12	20	6·37
Supplying Electricity only.	1889(1)	15	1	21	6·36
	1890	22(3)	—	10	4·86
	1892(2)	58	35(4)	8	2·27
Supplying Electric Light and Gas.	1889	18(5)	2	18	7·20
	1890	23(5)	7	10	5·00
	1892	25	8	10	4·54

(1) Years in which the profits of the companies were first stated in the returns.
(2) As to 1891, no returns came into my hands.
(3) All these companies were of, at least, two years' standing at the time of issue of the first returns. The oldest were formed as long ago as 1892; most of the others in either 1886 or 1887.
(4) Out of these 35 companies, 1 existed since 1884, 10 since 1886, 8 since 1887, 9 since 1888, 4 since 1889, and 3 since 1890.
(5) The returns do not show whether, at the time, all of the companies were already supplying electric light.

The average profits of the Edison Electric Illuminating Company of New York were: 1891, 4 per cent.; 1892, 5 per cent.; 1893, 5¾ per cent.

This table has been compiled from the returns of the Board of Gas and Electric Commissioners of the State of Massachusetts. This State extends over a large portion of the tract of land where European culture first made its appearance in North America. Its population stands second in order as to density, and its capital is the wealthy city of Boston. For all these reasons, and also because the data, which have been derived from official sources, are based upon the comparison of

a large number of gas and electrical companies, the figures given in the table may be said to be particularly significant and instructive. They show that the average profits of the gas companies from the year 1886—*i.e.*, the time of the issue of the first report of the Commissioners—to 1892 (the last report forwarded to me) had been subject to but very slight fluctuations; the average dividends paid having been 6·75 per cent. As regards the electrical companies, the average dividends, which amounted to as much as 6·36 per cent. in 1889, came down to 2·27 per cent. in 1892, in proportion as the number of central stations increased. So that the receipts the latter year scarcely exceeded one-third of those of the gas companies. The companies which combined gas and electricity have also experienced a very material falling off in their profits; the average dividends having sunk from 7·2 per cent. in 1889 to 4·54 per cent. in 1892. Yet in New York, owing to the exceptionally favourable conditions prevailing in that city, the dividends of the Edison Company appear to have gradually risen from 4 per cent. in 1891 to 5¾ per cent. in 1893.

Owing to the fact, alluded to above, that American consumers of electric light depend more on local installations or branch establishments than on central stations for their supplies of electricity*, the general development of the electrical industry is scarcely, if at all, affected by the smallness of the dividends of the central supply companies, but it steadily and surely advances and grows. But so also does the gas industry, which certainly shows no signs of weakness or flagging. As a striking illustration of this, I may mention Minneapolis—a busy, fast-growing town, which has already left its twin city St. Paul behind it, and the rapidity of whose advancement seems remarkable, even viewed in the light of American notions. In Minneapolis, then, last year's returns show an increase in the consumption of gas amounting to 37 per cent.; while before any central electrical works had been created there, the increase in the gas consumption represented only 20 per cent. Thus, within a period of nine years—from 1883 to 1892—the consumption of gas in that town had increased fourfold. This remarkable development is, to a very great extent, due to the energy with which the Minneapolis Gas Company have pushed the introduction of gas into general use for cooking purposes. Besides, our Minneapolis *confrère* informed me that three-fourths† of all the electrical incandescent lamps of the town are fed from local installations; while the arc lamps are supplied with electricity from a central establishment.

The prevailing confidence in the future of the American gas industry was further evidenced by the numerous new constructions of gas-works which I found all over the country. Taking some of them, I may mention the Calf Pasture station at Boston, and the new works at Newark (N.J.), Cleveland, Denver, and San Francisco. But perhaps nowhere was that confidence more palpably manifest than in Long Island City, where the recently created East River Company were then erecting the first really gigantic American Gas-Works for the manufacture of water-gas on an enormous scale, and whence it is intended to conduct the gas as far as New York, through a special large tunnel built at a considerable depth below the bed of the river.‡ In New York, the gas is, in the first instance, to be supplied to consumers direct; while later on it may be sold to the old gas companies, when their own resources within the city become insufficient to cope with the growing demand.

When these facts, which show how very firmly the future of the American gas industry is believed in by the native population, in spite of the enormous competition that has to be confronted—when these evidences of security are considered side by side with the state of things existing, not only in New York, but in nearly all large American cities, whereas in Pittsburg, for example, in addition to a large natural gas manufacturing company, there exist four other companies producing artificial gas, to say nothing of a number of electrical concerns, nor of the large quantities of mineral oil that are consumed (such oil being obtained in the immediate vicinity)—when, I say, all these facts are taken into account, one cannot help smiling at the narrow view which is still widely entertained by some of us in Germany, even in authorized circles, that a man's numerous and infinitely varied wants, as connected with light, heat, and power, may some day be all supplied by one individual industry; that therefore several kindred instances may not long continue to exist together, but that the one is bound, sooner or later, to supersede all the others, and to come out alone and victorious from the bitter struggle. Possibly the report of such facts as are gathered in this paper may, to an extent, assist in gradually dispelling so preposterous a notion.

* The same remark appears to be applicable to Germany, according to Dr. H. Bunte and Dr. Rasch's joint report entitled "Statistical Data as to the Extension of the Use of Electric Light within the Domain hitherto controlled by German Gas-Works." These data show that the proportion of the lamps fed from central electrical stations in Germany does not exceed 25 per cent. of the total number of lamps lighted; and, further, that one German town (Leipzig) uses the greatest number of electrical lamps in proportion to its population, although no central supply of electricity whatever has been hitherto provided in the city.

† This is just the same proportion which is stated by Bunte and Rasch as an average for Germany.

‡ The aggregate yield arranged for is 24 million cubic feet a day; the first plant being capable of turning out 6 million cubic feet daily. [A description of these works was given in the JOURNAL for April 24 last (p. 764); and the successful completion of the boring for the tunnel was recorded in the number for the 7th ult.—ED. J.G.L.]

Lastly, I should not like to take leave of America, even figuratively, as I am now compelled to do, without once more communicating to our American colleagues a word expressive of our sincere thanks for the great courtesy which they were pleased to show us—Professor Bunte and myself travelling at different times—not only by acquainting us with all the ins-and-outs and peculiarities of the American gas industry, but also by giving us other opportunities of becoming familiar with their highly interesting and in some parts incomparably beautiful country. Whenever we had a little time to spare, they were not content merely to let us go over works or industrial concerns, but very kindly acted as personal guides for us, both in town and country; at the same time attracting us to their clubs or their family circles, and giving us introductions to their friends as we travelled from place to place—never ceasing the while to exhibit a genial willingness to inform and instruct us on all and every subject in which we might happen to be interested. Gentlemen, I know that Germans are not incapable of emulating the hospitality, however generous, that is practised on either side of the Rocky Mountains; and I confidently hope that, if we should some day have the good fortune to welcome our American friends here, they too may, upon their return, have reason to preserve a grateful recollection of their stay in Germany.

SUPPLEMENT.

Average Life of Mantles used in Auer Incandescent Gas-Lamps, as experienced in the German Continental Gas Company's Works.

When the new incandescent gas-light first made its appearance, the Director-General Fähndrich, of Vienna, put the average life of the mantles employed at only 350 hours; while, when reporting, in Berlin, the results of experiments at Dessau, I took the following figures as a basis: When considering the illuminating power, the average life was taken as 500 hours; and, when considering the comparative cost, the average life was taken as 150 hours—that is to say, four incandescent bodies or mantles for every 600 hours.

The reports issued from the several gas-works of the German Continental Gas Company during the months of February and March of the present year, and covering a period of practical working of over a twelvemonth, bring out the following facts: In those establishments where the information had been most carefully collected—viz., those of Erfurt and M. Gladbach—the average life of the mantles used in Auer incandescent burners was: In apartments, 500 to 600 hours; in shops, 530 to 650 hours; in restaurants and offices, 650 to 850 hours. In reference to the other works, no such precise data had been obtained; and accordingly the average figures given were, upon the whole, somewhat lower. At all events, as has been justly observed by one of the oldest managers in the Company's employ, "the durability of the incandescent bodies or mantles mainly and primarily depends on the manner in which they are treated." We therefore have no doubt that, as the attendants gain experience, and grow more careful in dealing with these mantles and supervising their operation, it will be possible, in course of time, to still further raise their general standard of duration—in fact, among the numbers of hours recorded up to the date of the present report, and representing the time for which the mantles had, in actual practice, been kept lighted, there appear now such figures as 1534, 1820, and 1957; while figures nearly as high as, and even higher than these, are reported to have been attained within the practical experience at other German gas-works.

A fact worthy of special notice is that the lamp which continued burning for 1957 hours (from Nov. 17, 1893, to April 20, 1894) was unprovided with any regulator, and was subjected to varying pressures, fluctuating between 70 and 80 mm. at night, and between 45 and 65 mm. during the day. This circumstance induced the very painstaking, cautious, and observant writer of the report to add to his statement this general remark: "High pressure both enhances the luminous effect and renders the incandescent bodies or mantles more durable; being therefore preferable, even from an economical point of view."

With regard to the length of time during which a luminous body or mantle of this class will remain fit for use in lighting streets or places of public resort, no positive data, that may be relied on, have so far been obtainable, seeing that the number of hours during which combustion may be kept up for this purpose is apt to vary within very wide limits, according to local circumstances and to the mode of fitting adopted—for example, according as the illuminating bodies or mantles are fitted in chandeliers or brackets. But as to the eventual introduction of these lamps into use for street lighting, there appears, even at the present time, to be no doubt whatever. Besides, the figures which have been communicated to us by all the establishments of the German Continental Gas Company are, in themselves, quite sufficient to show conclusively that the final and permanent adoption of the incandescent gas-light, and to a greater extent than hitherto, is a matter beyond question. Any further progress that may be made in the methods of its production will, of course, be heartily welcomed; and in this connection it may be mentioned, as a matter for regret, that a certain incandescent body or mantle, which was entirely new, and possessed considerable firmness, was submitted to some of the visitors at the Carlsruhe meeting too late to be thoroughly examined by them.

IRON AND STEEL INSTITUTE.

The Autumn Meeting of the above Institute was opened in Brussels on the 21st ult., under the presidency of Mr. E. Windsor Richards. There was a full attendance of members; among those present being Sir Lowthian Bell, F.R.S., and Professor Roberts-Austen, C.B., F.R.S. A cordial welcome having been given to the members by M. Gillon, the Chairman of the local Reception Committee, the minutes of the last meeting were read by the Secretary (Mr. Bennett H. Brough), and approved. M. Gillon then read a paper on "The Iron and Steel Industries of Belgium," in which he traced their development during the past ten years, and showed how steel has been gradually substituted for iron. The paper was mainly statistical; and it went to prove that, while Belgium makes the same quantity of iron now that it produced in 1884, the manufacture of steel has increased 50 per cent. M. Briart followed with a paper on "The Coal Mining Industry of Belgium," in which he referred to the first use of coal in Liége, Charleroi, and Mons, somewhere about the eleventh century. He traced the rapid progress of the industry since 1825, and described in detail its present enormous dimensions. The author was complimented by Sir Lowthian Bell upon the comprehensive and instructive character of his paper. He remarked that coal was worked in Belgium under difficulties which did not exist in other countries; and he said great credit was therefore due to Belgian mining engineers. Other papers followed, and the meeting adjourned; the afternoon being devoted to a visit to the Antwerp Exhibition. On the resumption of the business the following morning, the President announced that the Council had selected as his successor Mr. David Dale, who had occupied the position of Honorary Treasurer of the Institute ever since its foundation 26 years ago. The name of the new President was very cordially received. The reading of papers was then resumed; the first being by Mr. D. G. Briggs on "Electric Power." After a few remarks upon the question of the cost of power, the author described an installation for driving by electricity the machinery at the National Arms Factory, at Herstal, near Liége. At these works there were, he said, 13 motors, having a total of 260-horse power, and an engine and dynamo combined of 500-horse power. This installation had been running successfully for three years, and had recently been extended by an additional 300-horse power plant. At the Vieille Montagne Zinc-Works, near Jemappes, an electric power installation had lately been put down; the plant consisting of a 600-horse power compound condensing engine, driving a 600-horse power dynamo at 80 revolutions per minute. Other electric power installations had been established, all of which were working successfully. In the discussion upon this paper, Sir Lowthian Bell gave water-driven electrical plant great credit for efficiency and economy in working. The next paper read was one by M. Lencauchez on "The Manufacture of Steel in the Open-Hearth Furnace." After mentioning the various modifications of the Siemens open-hearth furnace, the author described that devised by himself, in which he introduces a blast of air through the roof and sides. This arrangement, he claimed, increased the output and refined the pig iron by air. Other papers followed; and the meeting was brought to a close with the usual votes of thanks. The afternoon was devoted to visits to the principal places of interest in Brussels; and in the evening there was a *conversazione* and reception by the King of the Belgians (who is an honorary member of the Institute) in the Brussels Palace. On Thursday, the members visited various industrial establishments at Charleroi; and on Friday, they went to Liége and inspected the two most important metallurgical works in Belgium and an extensive colliery. These interesting and instructive visits brought the meeting to a close.

THE WATER AND GAS SUPPLY OF RAMSGATE.

On the occasion of the Summer Meeting of the Sanitary Inspectors' Association, lately held at Ramsgate, an address was delivered by Mr. W. A. Valon, J.P., the Engineer to the Corporation, in which he gave an account of the water and gas supply of the town, the drainage system, and the sea-front improvements. The following are the portions of the address dealing with the first-named subject.

Following closely upon the remarks of my friend Dr. T. G. Styan, the Medical Officer of Health, who has so clearly set forth in his paper the duties and responsibilities of sanitary inspectors, I would for a few moments turn away from the administrative duties devolving upon sanitary authorities, who confide to you those duties which are so graphically set forth in the paper, and without the faithful performance of which no structural arrangements designed by the engineer, however complete, can be successful. It is a fact of equal importance, however, that unless a good plan of drainage and a good system of water supply have been furnished by the local authorities for the sanitary inspector to work with, his efforts to keep the township or borough in a sanitary condition would be comparatively, if not wholly, fruitless. I therefore propose now, first, to give you a short description of the system adopted to furnish a supply of water in this town; and, secondly, some account of the way in which the main drainage of the town is carried out.

Until the year 1877, the water supply of Ramsgate and the district was in anything but a satisfactory condition. At that time, the supply was in the hands of a Company, who had allowed the works and mains to run themselves completely out, so that they could only give an intermittent supply—indeed, it may be said a very intermittent supply; for the upper levels of the town and district were entirely without water until quite late in the afternoon. These higher levels could only be reached by closing all the valves on the mains supplying water to the lower parts of the town; and thus, by allowing the pressure to accumulate in the pipes, and adding to that force by pumping directly into them against a weighted valve, sufficient pressure gradually accumulated to supply the higher district in the latter part of the day. This was a crude and unsatisfactory method of procedure, and, in case of fire, was inconvenient as well as dangerous. But it had its uses in at last stirring up the Local Authorities to buy the Company out; and it thus served to hasten on a constant supply.

The water-works were purchased by the Commissioners in 1877; and the necessary works were immediately undertaken to remedy the state of things then existing. The headings in the chalk, whence the water is derived, were extended. The total length of them at that date did not exceed 600 yards; but they have since been lengthened from time to time, until the total length of the tunnel running south-east and north-west is nearly two miles. The town and district have now a constant and efficient water supply. Immediately after the transfer of the works to the Commissioners, a brickwork tower, 60 feet high, was constructed at Southwood, at the highest point in the neighbourhood, surmounted by a cast-iron tank 80 feet long, 50 feet wide, and 10 feet deep, holding when full 250,000 gallons. This is directly connected by a pumping-main, which enters the bottom of the tank, with the pumping-station, situate about a mile and a half inland. The whole of the water supplied to the town is pumped through this main. The high-level reservoir, when full, overflows into a low-level reservoir, which holds 750,000 gallons, and supplies the lower parts of the town and district. The high-pressure mains are taken direct from the pumping-main, and are arranged in such a way as to allow of easy connection with the low-level district in case of fire, should it be thought desirable. So efficient has this supply proved itself hitherto that, although many fires have broken out during the past fourteen years, none have caused damage to any considerable extent. The firemen, who are well drilled and organized, are able, with a hand barrow and a flexible screw hose and a hydrant key, to subdue in a short time fires which, under ordinary circumstances, would cause very grave mischief. Contrast this with the system established in London—viz., the maintenance of divisional fire stations furnished with expensive machinery, which, when a fire occurs, must be moved from place to place, to the danger of life and the interruption of ordinary traffic, together with the immense quantity of water unavoidably wasted by the temporary arrangements needed to supply these engines; and yet, with all this costly and wasteful arrangement, it only gives a tithe of the efficiency that can be obtained from a common cast-iron main of proper dimensions kept under an unvarying head of water by the natural means of bulk at a higher point.

While the purity of the supply is shown to be beyond doubt—indeed, it is reported by the most eminent authorities to be one of the purest waters in England—it is needless to add that its abundance furnishes an easy mode of properly flushing and cleansing the subsidiary drains. I think, therefore, the borough and district may fairly claim to have a water supply which, in point of excellence and quantity, is second to no other town or borough in the kingdom.

There are numerous other interesting questions which arise in connection with water in its relation to sanitary matters, which it is not now the object of the writer or of the hearers of this paper to investigate. One, however, presents itself, to which I will give a word or two in passing. I mean the supply of water for domestic purposes by meter. This is constantly being urged upon local authorities by reformers who may be considered to be tolerably well informed; and much may be said in its favour. Any attempt, however, to move in this direction by presenting a Bill embodying a supply of water by meter, would receive from a Parliamentary Committee but little attention, unless at the same time it could be clearly shown that, for all useful purposes, the supply would be unlimited, and that the cost to the poor would be such as not to deter them from its ample and free use. I have before publicly expressed an opinion that both these conditions may be fully complied with while measuring and regulating the supply by meter. At the same time, I know there are many and weighty reasons which can be, and are, given for a continuance of the present method of levying a rate to provide payment for the supply of water; the principal of these being the necessity for a plentiful supply at a low rate to the poor living in small properties, in order that the health of the community may be maintained—so that rich and poor alike may be protected, and not allowed to suffer from bad sanitation in any part of the connected district. Any system of proposed measurement must have for its

object, and effectually provide against, any infringement of the condition named.

Mr. Valon then described the drainage system of the town, and proceeded as follows: As you all know, Ramsgate has of late years made very rapid strides, in competition with other watering-places, in an endeavour to hold its own, not only as a health resort, desiring to rank itself as second to none in the kingdom, but also as a place of pleasure and amusement for the increasing number of thousands who year by year visit it for the purpose of recreation and enjoyment. Not only have the public authorities spiritedly acquired the water-works supplying their district—which, I may add, I think every public authority, in order to properly discharge its duties to those whom it has under its care, should endeavour to do—but they have also become possessors of the gas-works, and are supplying to the burgesses of the borough an article of daily consumption second only in importance to the water supply. In both gas and water departments, the Corporation have cleared away old and useless works, and have substituted good, sound, substantial buildings and plant capable of supplying the borough and district for some years to come. It may be safely said that no other town or district in England is better and more cheaply supplied with two of the great necessaries of life—gas and water—than Ramsgate and the municipal district over which the Mayor and Council of the borough preside. In this connection, it is but fair that the fact should be recorded that the great advantage at present experienced by the Corporation from the possession of those two concerns is mainly due to the foresight, intelligence, and energy of the Rev. E. G. Banks, D.D., who was Chairman of the Commissioners in 1876-7, and who, during the period of his chairmanship, brought such parliamentary pressure to bear upon the Companies that they were compelled to treat with the town authorities for the disposal of their works, which up to that time they had not managed in so economical a way as to greatly benefit the public, nor did they administrate them in a liberal spirit. Dr. Banks was greatly assisted by the late Dr. Samuel Woodman, Mr. Lake Price, Mr. J. B. Hodgson, and other gentlemen. It was not, however, without great opposition, brought to bear through interested and other parties, that the works and concerns as a whole were handed over to the control of the then Commissioners; and they have since been wholly managed, first by them, and afterwards by the Corporation, exclusively in the interests of the ratepayers and burgesses.

The address concluded with a short description of the sea-front improvements now being carried out from plans prepared by Mr. Valon, to which reference has already been made in the JOURNAL.

THE ATOMIC WEIGHT OF CARBON.

At the recent Meeting of the British Association, Mr. J. A. WANKLYN read, in the Chemical Science Section, a short paper on the above subject.

Beginning by referring to the change in chemical notation which took place about thirty years ago, the author said the advocates of the new system made a practical application of their views by noting that the least number of grammes of carbon ever occurring in the standard volume of any carbon compound was 12; and that therefore this was the atomic weight of carbon. It was at the same time incidentally noted that in all those cases where more than 12 grammes of carbon were found in the standard volume, the number was either 24 or 36, or some other multiple of twelve; and so the matter had rested until the present day. The author went on to say that he was able to announce that (as the result of most laborious investigation carried on conjointly with his friend and colleague, Mr. Cooper) a multitude of carbon compounds exist wherein the quantity of carbon in the standard volume is not a multiple of 12 but of 6; and that consequently the atomic weight of carbon is 6, as was commonly believed by chemists a third of a century ago. He showed a carbon compound having the formula $C_{7\cdot5}H_{15}$ according to the notation in vogue at the present day; and stated that he and his colleague had six other half-carbon substances. These hydrocarbons, he added, exist in the Russian kerosene of commerce, from which they had been extracted by laborious and methodical fractional distillation.

In the discussion upon the paper, Dr. Odling remarked that the subject introduced by Mr. Wanklyn revived an old controversy. The atomic weight of carbon was fixed by Dalton in the first instance; and it remained at 6 for nearly fifty years after his death. The selection of this number, instead of 3, 9, or 12, was not based upon very definite evidence, but was rather the result of an accident—a mere shot—although it was the shot of a man of genius. He regarded olefiant gas as being a combination of one atom of carbon and one of hydrogen; and, supposing this to be the case, it was quite clear that the atomic weight of carbon would be 6. About forty or fifty years after Dalton had enunciated the atomic theory, it became possible, in the then comparatively advanced stage of organic chemistry, to form some determination of atomic weights of bodies as distinguished from combining preparations on questions of fact, and more particularly on questions of the constitution and metamorphosis of a great number of organic bodies; and it was a result of this that the atomic weight of carbon was fixed at 12. The determination of this number was based on such a mass of converging evidence that it would require a very great deal to upset it. He quite recognized that, up to the present, there was no group of facts antagonistic to Mr. Wanklyn's view. At the same time, if a group of well-established facts were made out—even if but a small group—it would be evident that a change would have to be made in one's conclusions, and the present opinions abandoned. As he understood, the body in the bottle before them contained $7\frac{1}{2}$ atoms of carbon, or 15 atoms to the value of 6. If Mr. Wanklyn had from this produced a chloride in which 1·15th of hydrogen had been replaced by chlorine, and if from this he had obtained the alcohol and the aldehyd acid, &c., and made out the metamorphic relations of these compounds, it would have been very different. But it seemed almost preposterous for one to give up such well-established conclusions on such very slender evidence. The evidence must be much stronger in order to convince chemists that the body shown was constituted of $7\frac{1}{2}$ atoms, or 15 reduced atoms, of carbon. The President (Professor Harold B. Dixon) concurred with Dr. Odling that chemists would have to keep to 12 as the atomic weight of carbon, notwithstanding the clear liquid Mr. Wanklyn had shown them. All the same, their thanks were due to him for his courage in coming forward with evidence of this kind. Mr. Wanklyn, in reply, said, with great deference to Dr. Odling, the whole question resolved itself into this: Did the liquid really consist of an immense multitude of molecules of the same kind, or did it consist of two or three multitudes of molecules of different kinds? He had been able to carry out his fractionation, and his seven substances consisted each of one single multitude of molecules, and not of several multitudes. He held that the existence of these liquids established the smaller atomic weight of carbon. There was a little confusion in saying there was much evidence against his view; for there was no evidence whatever against it. That the atomic weight of carbon is 6 was not opposed to any known fact; and the recognition of the true atomic weight would bring into view a region of organic chemistry which, up to the present time, had been hidden from sight.

THE COMBUSTION PRODUCTS OF COAL GAS CONSUMED WITH ARGAND AND INCANDESCENT BURNERS.

In a recent number of the *Comptes Rendus*, M. Gréhant gave an account of some investigations he has lately been making into the nature of the products of combustion of coal gas when consumed with an Argand and with a Welsbach burner. In carrying out his investigations, he employed the chemical process with copper oxide and his own method, whereby he was enabled to determine to great exactitude the merest traces of carbonic oxide. For the complete absorption of the carbonic acid, he used three Cloëz bottles filled with a filtered solution of potass in baryta water; and he was apprised, by a ring of barium carbonate, the moment the third bottle began to absorb carbon dioxide. The gases were then made to traverse two tubes (70 centimetres long) containing baryta water, which should always remain clear. To the end of the combustion-tube was attached another tube containing baryta water. All the points at which it was possible for air to enter were covered with india-rubber muffs filled with water, so as to be perfectly air-tight. The verification of the apparatus was effected in the following way: A mixture was made consisting of 34 litres of air and 3·4 cubic centimetres of pure carbon monoxide—by volume, 1 part in 10,000 parts; and the gas was caused to bubble slowly through the red copper oxide by means of a Golaz aspirator and a mercury pressure-regulator. After a short time, a well-marked ring appeared in the last tube. The decomposition of the barium carbonate in the vacuum of the mercury pump gave 3·4 c.c. of carbonic acid; corresponding exactly to 3·4 c.c. of carbonic oxide.

The author then proceeded to make tests with the two gas-burners. He lighted an Argand burner enclosed in a glass chimney having a metal shield communicating, by means of a cooler and an india-rubber tube, with the gasholder, the pressure in which had been reduced to the extent of 2 centimetres. The products of combustion amounted to 150 litres (5·3 cubic feet) in six minutes. The gas was passed slowly over the oxide of copper for 24 hours, with the result that for 73 litres a slight ring of barium carbonate was obtained, which, when decomposed, gave only 1·2 c.c. of carbonic acid. Consequently, in the products of combustion of the Argand burner, there was left a trace of gas containing carbon; but the proportion was so small that it might be estimated at 1-75,000th. The effect on the animal organism of inhaling these products of combustion was next tried—a dog being selected for the purpose. Having taken a sample of the blood of the animal in its normal state, in order to determine the combustible gas contained therein, it was made to inhale the products of combustion of an Argand burner. At the expiration of half an hour, another sample was taken, which was found to be exactly like the former one; thus demonstrating the absence of carbonic oxide in the products.

M. Gréhant next lighted a Welsbach burner, and tested its combustion products in a similar way to that described above. On passing 60 litres of the gas through the apparatus, he

obtained, after the copper oxide, a considerable quantity of precipitate, which, when decomposed, gave 23·2 c.c. of carbonic acid, corresponding to 23·2 c.c. of formene or carbonic oxide, or a mixture of the two gases. The proportion of this gas in the products of combustion was 1-2580th. On trying the effect of the gas on an animal, after inhalation for half an hour, 1·3 c.c. of carbonic oxide were obtained from 100 c.c. of blood, representing a proportion of 1-4300th of this gas in the air.

As the result of these investigations, M. Gréhant expressed the opinion that, from a hygienic point of view, it is highly important to allow the products of the combustion of coal gas to escape readily into the open air, especially when they come from a Welsbach burner.

In a note which he subsequently presented to the Académie des Sciences, and contained in the *Comptes Rendus* for July 30, M. Gréhant gave an account of a further experiment by him, which told rather more in favour of the Welsbach burner than the one previously described. Having demonstrated the presence of a very slight proportion of carbonic oxide in the products of combustion from one of these burners, he was led to inquire whether the quantity of this gas mixed with the other products of combustion would be sufficient, in a confined space, to set up blood poisoning. He accordingly carried out an experiment with the view of answering this question. He took as his "subject" a large dog, weighing 20 kilos. (44 lbs.), and drew from him 42 c.c. of blood, which, on being tested, was found to contain 19·25 c.c. of carbonic acid. The dog was then placed upon a table in a room having a capacity of 51 cubic metres (1800 cubic feet), and containing a new Welsbach lamp, which burnt with great regularity and brilliancy. The dog was fastened at a distance of rather more than 3 feet from the burner; and he breathed the products of combustion, which mingled with the air of the room. Seven hours after the commencement of the experiment, a second sample of arterial blood was taken, which showed 19·85 c.c. of carbonic acid—a rise of 0·60 c.c. As this experiment showed that the volume of carbonic oxide would be equivalent to the presence of 1-36,000th of this gas in the air—an absolutely negligible proportion—M. Gréhant came to the conclusion that the employment of a Welsbach burner could not produce blood poisoning.

Improvements at the Ilkley Gas-Works.—Last Wednesday, Mr. F. H. Tulloch held an inquiry respecting an application by the Ilkley Local Board for sanction to borrow £2600 for improving and enlarging the gas-works, which were recently acquired at a cost of £59,168. The Clerk (Mr. Hainsworth) explained that the consumption of gas had doubled during the past ten years; and an increase at the rate of 8 per cent. was now going on. Consequently, the Board were compelled to extend their works in order to keep pace with the increased demand. It was intended to expend the proposed loan as follows: £300 for the purchase of gas-stoves to be let out on hire, £1900 for the erection of two new retort-benches, £250 for additional gas-mains, and £100 for a mortar-mill and foundations. Mr. J. Gaunt objected to the loan, on the ground that the Local Board had already expended too much in the purchase of gas-works, and that a debt was likely to be created which he considered objectionable and unnecessary. Instead of spending so much on gas, he contended that the Board ought to have endeavoured to supply the electric light. A note was taken of the objection; and the Inspector viewed the works.

Brin's Oxygen Process at the Stoke Gas-Works.—At the meeting of the Stoke-on-Trent Town Council last Thursday week, the Executive Gas Committee recommended that, with the object of further testing Brin's patent oxygen process, the offer of their Engineer (Mr. Murray) to send down a representative, free of cost, to supervise and direct the working of the plant for a month be accepted. Mr. Marks inquired whether any good would be done by accepting the offer. Mr. Geen, in moving the adoption of the minutes, said, with reference to the point raised by Mr. Marks, that the Gas Committee were desirous of utilizing Brin's oxygen process to the fullest advantage. It had cost the Corporation £2500; and it had been discontinued since the 1st of December. The Committee were trying, if possible, to get some benefit out of it; and they invited the Engineer of Brin's Oxygen Company to meet them with the object of discussing it. After that discussion, the Engineer offered to send down a man for the purpose of working it at their own expense—the Council, of course, to find all the materials, and anything else that might be necessary. He hoped that in the course of two months the Committee would be able to report definitely to the Council as to what had been done. The minutes were passed.

The Sale of the St. Ives Gas-Works.—In connection with this subject, a letter which seems to require some explanation from the late managing body of the St. Ives Gas-Works has been addressed to the *West Briton* by a correspondent signing himself "Shareholder." According to him, the shareholders did not receive the slightest intimation that the works were to be sold by public auction; and he complains that the sale was not advertised in a proper manner, so as to realize the best possible price. Several prominent men in Cornwall with whom "Shareholder" had been in communication also declared that they were equally ignorant as to a sale having been effected; and "the inference," he remarks, "is obvious that the sale was conducted in what some people may term practical secrecy." It is well known, he adds, that several shareholders and friends, had they known of the proposed sale, would have formed a syndicate—practically a Cornish one, too—to have put the Company on a better footing; and certainly would not have allowed the works to have gone for such a ridiculous and absurdly small sum. In concluding his letter, "Shareholder" appropriately asks what has become of the Directors and Secretary; and also why did not they, in the interests of shareholders, stay execution, considering there was such a paltry sum in question?

REGISTER OF PATENTS.

Coin Gas-Meters.—Orme, D., of Oldham. No. 15,740; Aug. 19, 1893.

This invention in reference to prepayment wet and dry gas-meters is intended as an improvement on the apparatus described in patent No. 18,490 of 1890, where the supply of gas was interrupted by arresting the motion of the bellows or drum. In the present case, the gas is shut off by the closing of a valve, acted upon by parts receiving motion through gearing from the drum or bellows.

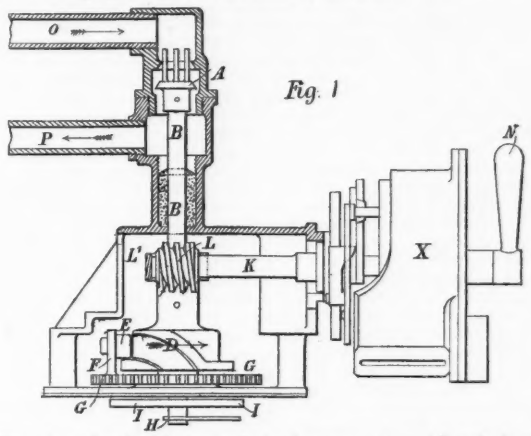


Fig. 1

Fig. 1 is a plan (partly in section) of an arrangement for closing the valve which shuts off the supply of gas, when the quantity paid for has been consumed.

The valve A is mounted loosely on the end of a spindle B, capable of being slid to-and-fro by means of a cam D, also carried by the spindle. The cam is formed with a groove, adapted to confine an anti-friction bowl or pin E, which is carried by a projection F from the spur-wheel G. This spur-wheel is part of the mechanism of the patentee's former arrangement of prepayment meter; and it is connected to the usual train of gearing from the bellows or other measuring parts of the meter, so as to rotate and move the index-finger H, which revolves in front of the dial I. X, the money-box, is practically identical with the coin-receiving mechanism described in the former patent. As before, the spindle B is geared to the central spindle K of the coin-receiver X by a worm L and worm-wheel; so that, when the coin-receiver is operated by the handle N, upon the insertion of a coin, the spindle B is rotated to a certain extent, and as the worm-wheel is a fixture on the sleeve of the cam D, the cam is turned in the direction of the arrow.

When the cam is so turned as to be in advance of the bowl E (as shown), the valve A is away from its seat—allowing gas to pass into the meter from the supply-pipe O, through the pipe P, which conducts the gas to the measuring mechanism. The passage of the gas through the meter drives the gearing which operates the spur-wheel; the spur-wheel carrying round with it the bowl E. So long as the bowl is in that part of the cam-groove parallel to the face of the wheel G, the position of the spindle B is not altered, and the valve A remains open. But when the bowl comes up with, and enters, the inclined part of the groove which appears in fig. 1, the cam and the spindle B are slid longitudinally, and the valve A is shut down upon its seat, and stops the supply of gas. The gradual closing of the valve lowers the light, and warns the consumer that his supply is about to be cut off; so that he may purchase a further supply by inserting another coin, and operating the coin-receiving mechanism so as to again advance the cam D.

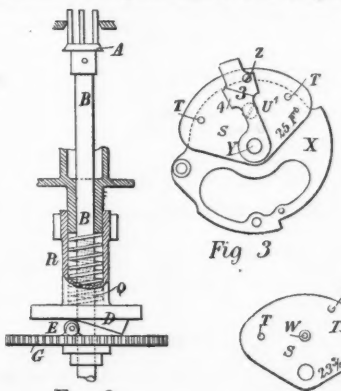


Fig 2

Fig 3

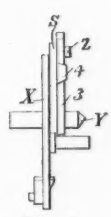


Fig 4

Fig 5

Fig. 2 illustrates the combination of the valve-closing cam-face with a valve-opening spring. The inclined or cam face D projects from the head of a sleeve G, secured to the sliding spindle B, carrying the valve A, as before. A bowl E is borne by the spur-wheel G, and is arranged opposite to the inclined or cam face D. The sleeve has formed on it the worm-wheel gearing with the worm L on the money-box spindle; so that the sleeve, with its inclined or cam face, is advanced by the operation of the coin-receiving mechanism, in the same manner in which the cam D in fig. 1 is advanced. When the bowl on the spur-wheel overtakes the incline D, the sleeve and shaft B are slid against the pressure of the contained spring R, so as to close the valve; but when the sleeve, with its cam face, is again advanced, the spring R slides back the sleeve and shaft, so as to open the valve.

The remaining part of the invention refers to means for altering the stop on the disc of the coin-receiving mechanism, so as to vary the quantity of gas delivered for a given coin—say, a penny. In the 1890 specification, fig. 3 shows how it is proposed to alter the position of the stop by shifting a screw from one hole to another. In the present arrangement, the ring of holes necessary is dispensed with, and interchangeable plates S (see figs. 3, 4, and 5) are substituted. Upon the disc X (which corresponds to the disc in the former specification) there are two steadying pins T, and a screwed hole to receive a screw W. The plates S are all made to template; and each plate is bored to receive the steadying pins and the screw. The plates are also bored to slip on the centre stud Y of the disc. It will therefore be seen that every plate of the series occupies exactly the same relative position on the disc; and the only difference between the several plates lies in the position of a screwed hole Z, whereby the position of the stop 3 is governed. As set forth in the specification of 1890, this stop is in the path of the projecting edge of the coin as it is carried round by the coin cylinder. The further the stop is set away from the coin, the less distance will the coin move it; the less will the cam D be advanced; and the less gas be delivered in exchange for the coin. On the contrary, the nearer the stop is set to the coin, the more gas will be delivered. Therefore each of the series of plates S has its screw-hole Z in a position which will set the stop closer to, or farther from the coin than is the case with any of the other plates. Thus, by providing the requisite series of plates, the stop can be set to deliver, for a fixed coin, a suitable proportion of gas, calculated according to the market price. In fig. 3 the plate on the disc is marked as delivering 25 feet of gas for 1d. In the plate shown in fig. 5, the screw hole Z is set to give only 23¾ feet for 1d.; and similarly the delivered quantity of gas for 1d. or other coin may be varied by simply changing the plate.

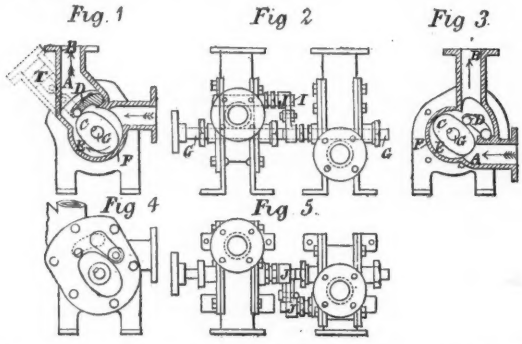
As a modification of this system, instead of using the plates S, a number of stops might be provided varying in shape, but being always secured at a fixed point to the disc. For example, the part marked 4 is the face on the stop 3, which the edge of the coin comes against; and by making a series of stops, with faces 4 projecting more or less, the requisite varying delivery of gas could be obtained.

Preventing Water-Fittings being Choked with Ice.—Adams, C. H. and C. H. H., of Guildford. No. 17,929; Sept. 23, 1893.

This invention relates to the construction of bib and drawing taps of such an elongated form as to allow the drawing parts to be in the usual position (where they are necessarily exposed to the action of frost), while the valves are situated beneath the ground, or other inexposed position; one of the valves being so arranged as to open automatically or otherwise, so that it will allow the water to drain off from the elongated portion of the tap after use, and then automatically close while the tap is in use and water being drawn therefrom.

Rotary Pumps, Blowers, and Engines; also applicable for Measuring Fluids.—Tipping, H., of Greenwich, S.E. No. 16,079; Aug. 25, 1893.

The object of this invention is to "provide more efficient rotary pumps for drawing and forcing liquids and gases, and engines actuated by liquids or gases, and also apparatus applicable for use in measuring water or other fluids."



Figs. 1 and 3 represent sectional views of the apparatus. Fig. 2 is an elevation. Fig. 4 is an end view. Fig. 5 is a plan of two pumps on one axis.

A is the inlet; B, the outlet; and C, the piston. E indicates a space formed in the cylinder F as the piston revolves on its axis G. D is a hinged flap or abutment, having an arm I, to which is secured the lever J. A roller K is fitted to the lever, which is operated by the cam M, to prevent the flap from being lifted off the piston when running at high speed; and another is fitted into the end of the flap which bears on the piston, in order to reduce friction when forcing to a considerable height or against great pressure. The weight of liquid acting on the flap would also tend to prevent the flap lifting off the face of the piston. The ends of the piston and the flap fit so as to work smoothly against the cylinder covers.

In figs. 2 and 5 two pumps work on one axis G; and the flaps or abutments of each cylinder are coupled by connecting-rods attached to the ends of the levers J. By this arrangement, any pressure acting on one flap is counterbalanced by the pressure acting on the other one; and each flap is so guided by the rotary motion of the piston of the other as to prevent either flap from lifting off its piston. When this arrangement is adopted, the roller in the end of the lever D is allowed sufficient play to admit of its motion on the piston C by means of the pressure acting upon the roller.

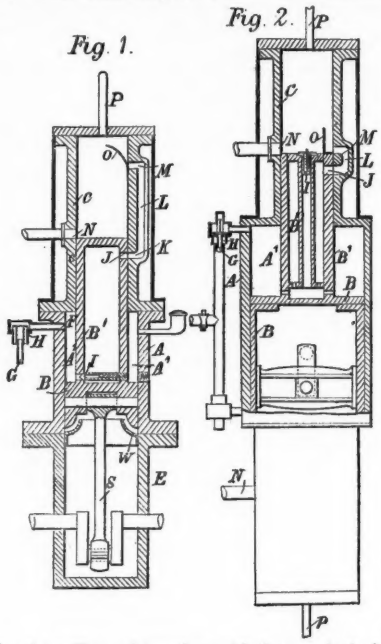
In some instances, the patentee proposes to use a piston T working in the cylinder shown in dotted lines; the piston being connected to the flap D by a rod. The pressure acting on the piston T thus counteracts (or partially so) the pressure on the flap D.

When the apparatus is used as a pump or blower, it revolves in the direction indicated by the arrows; when used as a gas-engine, or for measuring fluids, it revolves the opposite way.

The operation of the apparatus is as follows, when used as a pump or blower: The liquid or air is sucked through the pipe A into the spaces E of the chamber or cylinder by the rotary motion of the piston C, and is discharged through the outlet B. When used as a gas-engine, the gas, when admitted, acts on the piston while the flap is extended; and the pressure assists the rotary motion. When used for measuring fluids, however, the pressure tends to keep the flap on the face of the piston.

Gas-Engines.—Garner, C. N. of Camden Road, N., and Sherrin, J. V., of Ramsgate. No. 16,411; Aug. 31, 1893.

This invention refers to gas-engines in which an explosion is obtained in the cylinder at every revolution. Fig. 1 is a section through such an engine; and it may be considered as a plan of a horizontal, or a section of a vertical engine. A is a large cylinder, wherein works a piston B B^1, shown in the lowest or outermost position; the part B fitting the cylinder A, and the part B^1 (of smaller diameter) producing the annular space A^1. The part B^1 fits and works in a small cylinder C. The space A^1 is about equal to that traversed by the piston B in the cylinder C. The connecting-rod S from the crank-shaft is jointed



directly to the piston B; and together with the crank-shaft bearings, it may been closed in a chamber E. The port F serves to admit gas from the gas-valve G and air from the air-valve H. In the piston part B is a valve I for allowing gaseous mixture to enter the interior of the piston part $B,^1$ provided with a port J. By the port K in the small cylinder C and the passage L and port M (when the piston is in the position shown), heated gaseous mixture is admitted from the piston B^1 to the cylinder C. O is a deflector-plate for keeping the fresh charge from being drawn partly into the exhaust port N before the ignition takes place. The ignition is effected immediately the hot charge has been compressed by the upstroke (or instroke) of the piston. A small part of the charge further heated by the compression enters the tube P, which is closed at the outer end, and rendered hot by each explosion and by a gas-jet playing on it. The cylinder C, on the other hand, has a water-jacket, which takes up a great part of its heat.

The action of the engine is as follows: Supposing the piston B B^1 to be at the top of its stroke, on descending or returning, air and gas are drawn into the annular space A^1 from the valves G and H until the bottom of the stroke is reached—that is, the position shown on the drawing. Thereupon, on the rising of the piston, the charge is compressed in the annular space A^1; the hollow piston B^1 being filled with a compressed charge from the space A^1 in the previous revolution. During the early part of the upstroke, the compression effected in the space A^1 opens the valve I, and sends the charge from A^1 into the hollow piston B^1; and at the same time compresses the previous charge in the cylinder C. The charge is then ignited by coming in contact with the hot walls of the tube P, when the piston B^1 is at the end of its stroke; and the piston is then carried down again, and forces the products of combustion through the port N. Finally, when the ports J and K come opposite each other, the rush of compressed explosive mixture from the hollow piston B^1 into the cylinder C further expels the burnt products.

The engine may also be duplicated, as illustrated in fig. 2. Here there is a small cylinder C with an ignition chamber and tube P at each end, and a large cylinder A with an annular space A^1 for each piston B^1. The valve H G for air and gas is here shown made like a flat rubber-lined disc. The crank-shaft is in this case in the centre of the double engine; and motion is communicated to it directly by a slotted crosshead without connecting-rods. A modified arrangement of the valve I is here shown. The deflector O also in this construction is represented applied to the piston B^1; and the port M is arranged lower down in the cylinder C.

Ladder for Gasholders.—Gadd, W., of Manchester. No. 17,345; Sept. 15, 1893.

The object of these improvements is "to provide a ladder which can be permanently affixed to the inner lift or lifts of a telescopic holder,

and yet allow of sufficient foothold thereon." To accomplish this, the patentee proposes to attach, at or about the top of the topmost or inner lift of the holder, a bracket projecting sufficiently from the face of the holder to suport a ladder (preferably of iron) which, when the gasholder is fully extended, reaches to some little distance below the top edge of the dip of the next lift, but outside such lower lift. By preference there are attached to the bottom end of the suspended ladder rollers or wheels, free to turn on their axes, and which rest on the outside face of the lower lift; or else the ends of the ladder are caused to slide on rails, or the slides of the ladder run in grooves for telescoping the same.

In applying the invention to telescopic gasholders with a spiral motion when ascending or descending, the patentee provides spiral rails attached round or partly round the face of the lower lift, and extending from top to bottom; and on these rails may ride one or more of the running rollers already referred to—the wheels being flanged for the purpose. It is proposed to attach a ladder to each of the inner lifts of the holder; and in case of a vertical motion holder, to allow the upper ladder to be guided in its ascent and descend by sliding in grooves or other guides in, or attached to, the supporting brackets on the lift next below.

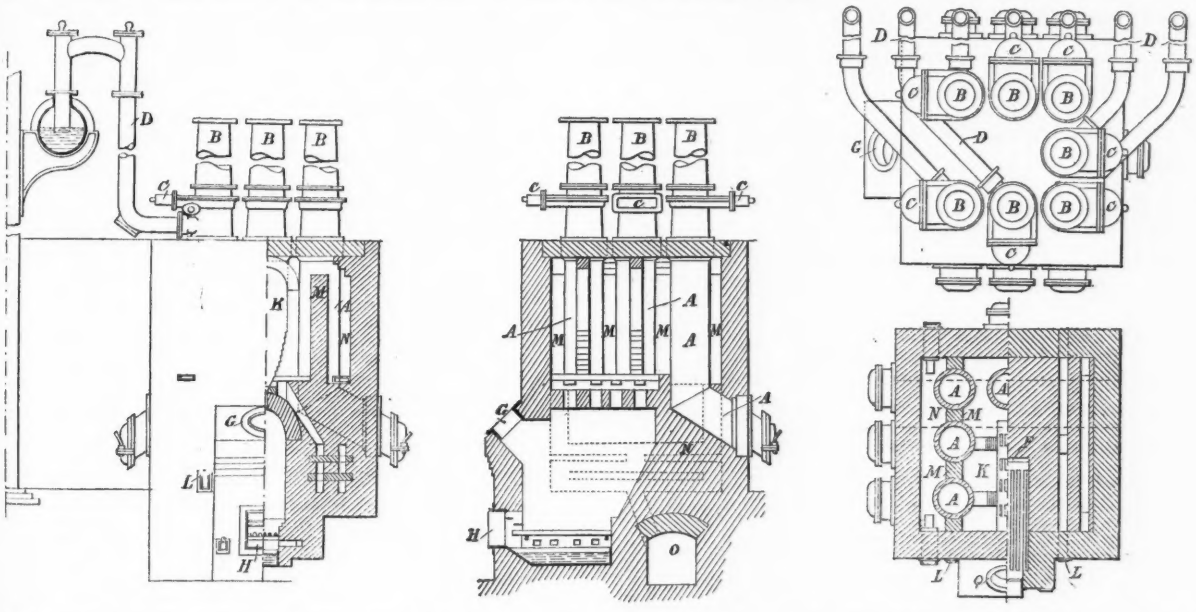
Manufacture of Gas.—Mansfield, E., of Manchester, No. 17,811; Sept. 22, 1893.

These improvements have for their object "the manufacture of gas from sawdust, shavings, straw, pine-needles, cones, leaves, or other vegetable refuse"—using (by preference) inclined retorts.

A are the retorts; and B, hoppers provided with sliding doors or valves C. The hoppers are constructed of greater capacity at the bottom than at the top, to prevent their being choked with the vegetable matter operated upon. D are pipes to carry off the gas as produced; and these lead to a bridge-pipe connected with a seal as usual. In practice, the doors or valves C are kept closed, except for the periodical admission of fresh fuel charges to the retorts; and the manufactured gas is thus deflected into the pipes D for passage to any subsequent apparatus for purification or storeage. The retorts shown in the engravings are provided with doors for the removal of ash or spent matter therefrom; and they are partly vertical, and partly inclined, as being a convenient form for setting. They may, however, be wholly inclined or vertical, or horizontal, if desired.

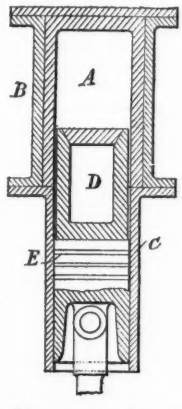
The material for heating the retorts—by preference coal or coke—is introduced into the furnace through the orifice G; and the opening H is provided for the withdrawal of spent fuel, and for the removal of the fire-bars for cleaning purposes. This latter process may be accomplished without destroying the fire, by previously thrusting into the furnace temporary bars, which receive support from the ledges or plates shown.

In operation, both the openings G H are kept securely closed; and the necessary air for combustion of the fuel passes through apertures from without—the supply being regulated by the sliding-doors. The heated gas, in the form of carbon monoxide, passes from the furnace through nostrils into the combustion chamber K, where it meets with a quantity of air, which flows in from the outside of the apparatus, through regulating doors L and a series of passages. The heated gases take fire on coming in contact with the supply of air, afterwards passing over the partition M into the space N, whence they emerge, by a series of passages into the chimney-flue O, and so pass away into the outer air. By this means, says the patentee, "the retorts are continuously enveloped in ignited gases for a considerable portion of their surface, and the action of the heat is utilized to a great extent."



Cylinders and Pistons of Gas-Engines.—Vaughan-Sherrin, J., of Stockwell, and Garner, C. N., of Camden Road, N. No. 18,152; Sept. 27, 1893.

This invention is designed to obviate the loss of heat and power by conduction and radiation through the walls of a cylinder of a gas-engine, by constructing it as shown in the engraving.



The cylinder is made of two parts—the one A in which the explosion takes place, and which is made of thick hard stone or earthenware, or other suitable non-conductor of heat, which is held in an outer steel or iron case or cylinder B; and the other part C, made of cast iron or other suitable metal. The two parts A B and C are fixed end to end, or the part B and C may be cast in one. The piston is likewise constructed in two parts—the one D made of hard stone or earthenware or other suitable non-conductor of heat; and the other part E, of ordinary metallic construction. The latter works gas-tight in the metallic part C of the cylinder; but the part D is made so long that it reaches into the part A (wherein it works with clearance), while at the utmost end of the stroke in the part C. Sometimes the end cover would be made of non-conducting material, and be provided with a deep annular rim, so as to form a lining corresponding to the lining A in the combustion chamber.

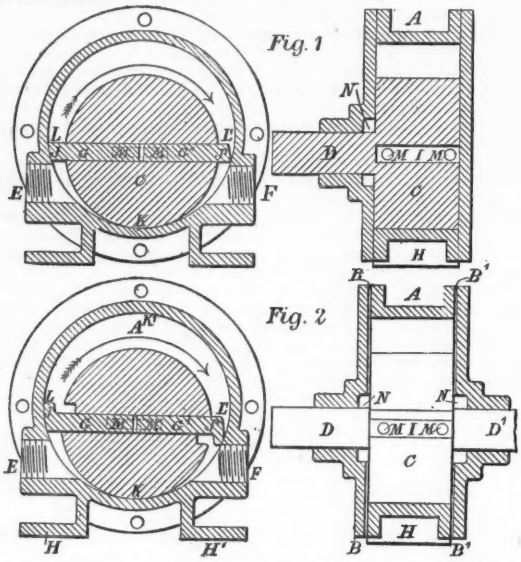
Gas-Stoves.—Clark, S., Hatcher, F., and Challis, E., of Islington, N. No. 18,314; Sept. 29, 1893.

This invention refers to gas-stoves in which a circulation and condensation of the products of combustion are effected; and it has for its object "the reduction in height of the stove, the more effectual heating of the lower part of the room, and the circulation of air from near the floor and above the burners through certain passages and chambers, where it is heated, and out of the top of the stove into the room."

For this purpose there is formed at the lower part of the stove a shallow condensing chamber, close above which the burners are fixed. The products of combustion pass into a tube or chamber immediately over the burners, and opening at its upper part into a shallow intermediate chamber extending over the top of the stove. They then pass from this intermediate chamber down a tube into the bottom or condensing chamber—partially condensing in their passage. The gaseous products of combustion not condensed then rise up a tube or tubes (preferably two) into an air chamber situated above, and extending over the shallow intermediate chamber. The chamber immediately above the burners, and first receiving the products of combustion therefrom, has elbow air-tubes fixed in it, which receive fresh air from the room, and pass it into the air chamber at the top of the stove; the air being heated by the products of combustion surrounding the tubes conveying it. The air chamber at the top of the stove has openings to deliver the heated air into the room; and the bottom or condensing chamber has an outlet for the condensed products of combustion. In the bottom of this chamber, air-tubes are fixed, which are open at their lower ends, and rise up a certain distance into the tubes connecting the condensing chamber with the uppermost or air chamber. In this way, a current of air from the bottom of the room is induced up the tubes; becomes heated; and, after passing into the air chamber, escapes therefrom into the room.

Rotary Pumps, Pressure Blowers, and Exhausters.—Towlson, J. T., of Norwich. No. 18,329; Sept. 30, 1893.

This invention relates to a pump, blower, or exhauster consisting of a combination of an outside cylinder with a rotating piston located eccentrically in the outside cylinder, and having a divided sliding abutment, with lips adjusted by springs; also a plate (of any suitable metal or material) between the flanges of the containing cylinder and the outer covers.



The cylinder is made of a truly circular bore, with a piston C rotated (by hand or power) by means of a central shaft on one or both sides of the piston. The piston C is shown with two bearings D, D¹ in fig. 2, and with one bearing D in fig. 1. It may be driven in any or either direction; but for the purpose of the present description, it will be assumed to run in the direction of the arrow. E is the inlet nozzle, and F the outlet or discharge nozzle. G G¹ are the two halves of a divided abutment of any convenient material, made to slide radially in a slot provided in the piston, and extending quite through it axially and also diametrically. I is a radial groove in the piston, in which the two halves of the divided abutment slide. J J¹ are faces of the halves of the divided abutment that are kept in close working contact with the cylinder bore.

The axis of the rotating piston, being located below the axial centre of the containing cylinder, it is necessary that the two halves of the divided abutment G G¹ should diverge and converge in relation to each other (when rotating with the piston) a distance equal to the difference between the maximum diameter of the cylinder bore K K¹ and the minimum diameter L L¹, measured horizontally across the axis of the rotating piston. This movement is supplied and controlled by springs in one or both halves of the divided abutment.

In fig. 2, the outer edges of the two halves of the sliding abutment are provided with lips J J¹ projecting on the pressure or delivery side of the abutment, so as to constitute a means whereby the pump may be made to deliver against considerable pressures. In action, these lips being exposed to the pressure the pump is forcing against, the greater the pressure, the harder the edges J J¹ are pressed against the bore of the cylinder. The action of the vacuum on the suction side of the abutments also tends to pull the two halves of the divided abutment apart; thus causing close contact with the bore of the containing cylinder.

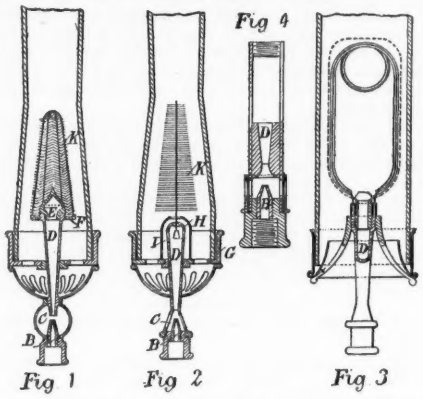
When the pump is rotated in the direction of the arrow, a vacuum is formed behind the half G of the divided abutment into which the fluid flows; and, on the piston being rotated, the half G¹ covers the inlet port before G uncovers the outlet—thus preventing the fluid that has been displaced by the former stroke from returning through the inlet port.

Incandescent Gas-Burners.—De Mare, F., of Paris. No. 10,497; May 30, 1894.

This invention in incandescent burners is shown in the illustrations. Fig. 1 is a section of the burner, with an "ejector" D arranged to receive a conical radiant mantle K, as in the "Bengel" burner. Fig. 2 shows the ejector capped by a conical air chamber H, and surmounted by an erection K composed of radiating tissue. Fig. 3 is a sectional elevation of a burner with a gallery and ring supporting a filament. Fig. 4 shows a section of the ejector D with an adjustable outer tube, by which the supply of air can be admitted or excluded, so as to give at will a white or blue flame.

A union or connecting piece, screwed for receiving the end of the gas-tube, receives the steatite tube B. It is also connected with the spherical air chamber C, interposed between the tubes B and D. Directly above the tube B is the conical conductor D. This is screwed into the air-chamber C, and has a cone-shaped mouth, as shown in fig. 2. At the upper end of D, the mixed gas and air impinges on the steatite distributor E, which is pierced with a series of holes arranged quincuncially or in line. The base E is furnished with a cross-bar F, to support the illuminating cone. The burner has also a chimney-gallery L, with a perforated cap.

The burner in fig. 2 has a different form of distributor. The conducting tube D is closed at the top by a small steatite cap H, and is pierced laterally by six apertures of trapezoidal section. Thus the gaseous mixture escapes by the sides, and enters by the annular chamber I, pierced on top by a large circular opening, and below by small air-inlets. The radiating tissue K is supported by a standard attached to the steatite cap H. The flame of the burner is guided across the horizontal rays of the tissue by a glass chimney; and the air with which the burner is fed is admitted by the perforated cap I in which filtering material can be placed.



The burner itself, as shown in fig. 4, is merely a Bunsen burner, in which there is a special passage D, formed by two cones connected at their summits. In these burners, the patentee claims that there are several special points: The conical form of the tube hastens the speed of the gaseous mixture when leaving the air chamber, and increases its pressure. This has the important advantage of preventing the flame from lighting-back to the air chamber. Another advantage is the formation of the distributor and the tube B in steatite, so as to minimize its conductibility. For the conducting-tube B, the hardness of the material ensures the gas-outlet remaining the same. To avoid loss of time and trouble in lighting, a small flame can be kept burning. This is secured by a carefully adjusted circular groove in the distributing-tap M near the orifice for the passage of the gas.

APPLICATIONS FOR LETTERS PATENT.

15,453.—Tilghman, B. C., jun., "Detecting and measuring the presence and amount of inflammable gases or vapours mixed with air." Aug. 14.

15,469.—M'Dougall, A., "Treating coal dust, small coal, and coke to improve them, or render them fit for use as fuel or for the manufacture of gas." Aug. 14.

15,470.—M'Dougall, A., "Preventing the explosion and ignition of inflammable gases and coal dust in coal mines." Aug. 14.

15,486.—Edwards, E., "Manufacturing coke and charcoal, and separating the products obtained in such manufacture." A communication from the Internationale Gesellschaft für Torfverwaltung. Aug. 14.

15,487.—Kowalski, H., "Filtering and sterilizing water." Aug. 14.

15,491.—Wise, W. L., "Gas-stoves." A communication from A. Rothenbach. Aug. 14.

15,507.—Barker, J., and Handley, T., "Joint for connecting water-taps and service-pipes." Aug. 15.

15,576.—Frost, H. H., "Fluid meters or motors." Aug. 16.

15,658.—Fletcher, T., "Atmospheric gas-burners." Aug. 17.

15,705.—Holmstrom, C., "Gas cooking-stoves." Aug. 17.

15,747.—Simmonds, H., "Prepayment or coin-freed gas-meters." Aug. 18.

15,771.—Gautsch, C., "Preventing or localizing the explosion of inflammatory gas or dust in coal mines or elsewhere." Aug. 18.

15,851.—Stecke, A., "Cooking-range adapted to burn either coal or gas or both." Aug. 20.

16,047.—Darwin, H., "Burners for gas-fires, stoves, and other gas appliances." Aug. 23.

16,199.—Meldrum, J. J., T., and J. W. "Supplying air to furnaces, and steam-jet blowing or forcing apparatus." Aug. 25.

16,230.—Saurer-Hauser, A., "Heating and igniting devices for gas-engines." Aug. 25.

Proposed Gas-Works for Wadhurst.—A Company has been formed at Wadhurst for the purpose of establishing local gas-works. An effort to purchase the Dewhurst works from Mr. Pearson Gee having been unsuccessful, the endeavours of those promoting the undertaking will be directed towards the erection of entirely new ones.

New Gas-Works for Pontypridd.—The Pontypridd Local Board have recently acquired land adjoining the railway at Treforest for new gas-works; and at the last meeting of the Gas Committee complete drawings of the proposed works were submitted by Messrs. Thomas Newbigging and Son, of Manchester, who were instructed to proceed with their erection forthwith. The works are rendered necessary by the rapidly growing demand for gas in the town and district, which has outstripped the present means of production.

Harrow District Gas Company.—The report of the Directors of this Company for the half year ending June 30 last is a brief one. It announces that the progress of the Company has been satisfactory; that the Harrow and Stanmore Gas Bill has received the Royal Assent; that the balance of profit and loss account is £1831; and that the Directors recommend dividends at the following rates per annum: 7½ per cent. on the original "A" capital, 7 per cent. on the first additional "B" capital, and 5¼ per cent. on the second additional "C" capital, all less income-tax. The revenue account shows that the total income was £5056, as against £4585 in the corresponding period of last year; the expenditure totalled £3243, compared with £2928; and the profit was £1813, against £1657. The meeting of the shareholders was held yesterday; and a report of the proceedings will be published next week.

CORRESPONDENCE.

[We are not responsible for the opinions expressed by correspondents.]

Illuminating Power and Illuminating Effect.

SIR,—The enclosed letter on the above subject has been addressed to me by a well-known engineer. It is so full of suggestive matter, and is so interesting, that I have asked his leave to publish it; and he has consented—desiring, however, that his name should be withheld. There is food for thought in it, whether or not we agree with the writer in all his conclusions.

THOS. NEWBIGGING.

Manchester, Aug. 29, 1894.

[ENCLOSURE.]

I have read your paper, delivered at the recent meeting of The Gas Institute,* and of which you kindly sent me a copy, with much pleasure, as it gives expression to views on the illuminating effect of gas which I have held for a very long time, although, as it is a subject not much allied to engineering construction, I have seldom given expression to my ideas.

To me a mere *speck* of light of *great intensity* is not nearly so effective as a *large body of flame* of much less intensity, although the former may register much more on the photometer than the latter. This first impressed me on having my attention drawn to the fine body of light emitted by the Wells and Lucigen lights. I was told by the manager of an important gas-works in the North that he had lost several good customers among the iron people, because he could not obtain a gas-burner to compete with the above-named lights. Several burners were made specially, all of the high-power incandescent class—expensive and very cumbersome in construction. They only gave a comparatively small body of light-giving flame—that is, even when compared with the light mentioned, they were specks of high intensity, evolving much heat. Indeed, I was given to understand that the burners could not be made of more than a certain candle power, owing to the heat melting down the apparatus. This highly intense hot speck of light seems to me to be working on the wrong lines. One of the great advantages of gas over electric light is surely that it is capable of being spread out into a thin film of broad flat flame; whereas in electricity a mere speck or thread of intense light is *compulsory*. Sufficient is not made of this point. The thin film of broad flame is pleasant to look upon; whereas the concentration speck is painful. Moreover, the apparent light-giving effect of the former is greater than that of the latter.

A large flame of low illuminating power gas is better than a smaller flame of high illuminating power gas. I think this is apparent to anyone visiting the principal towns in Scotland, where the flames are small in the street lamps, but high-grade gas is used, and as much light is *supposed* to be given out as in towns using gas of a lower standard, but bigger flames. It seems absurd that a very high-power gas is demanded, and then when the people get it they have to put on opal globes to subdue the light, and prevent the full intensity striking the eye. It might almost be put that they demand 17 or 18 candle gas *inside* their globes, but *outside* of them they only want 13 or 14 candle gas. . . . Referring to the correspondence which has subsequently appeared in the JOURNAL, I see one letter (by "Provincial Manager") refers to opal globes increasing the illuminating effect. This bears out the leading idea; for the opal globe breaks up the concentrated speck of light, and enlarges it, and, by a process of expansion of light-atoms (to use an unscientific expression), diffuses the light to greater advantage. Just as a lens may, as it were, gather together the scattered rays of light, and concentrate them upon or into a single speck—which speck may be vastly inferior to the same rays in their expanded, scattered form, area for area—so the globe performs a duty the reverse of this. It breaks up the concentrated speck, and diffuses it in a scattered, expanded manner *more appreciable to the eye.*

An idea here suggests itself: Do we not, in judging of the various illuminating effects of light, neglect too much the mechanism of the eye itself, or rather its action, and the manner in which it *takes in* light? Everyone knows that a strong, intense speck of light causes the iris to close; or, in other words, the curtains are drawn closer over the brain's windows. Hence there is not the same volume of light entering the eye (so to speak) as when the same quantity of light is more diffused; and the eye is in a *better condition to admit it*—viz., with the curtains wide drawn. May this not, in a degree, explain why an expanded volume of light registers a greater illuminating effect upon the retina than does the same quantity of light in its more concentrated form? The iris diaphragm in a camera lens would serve as a good illustration of how the quantity of light admitted to the eye may be diminished by the contraction of the iris, which always takes place in intensely concentrated light.

We appear to have exalted the photometer into the place of our own common-sense eyesight, and have forgotten that the expansion and contraction of the iris is an element which should be strictly taken into account if we are to be *absolutely exact* in the measurement of comparative illumination. We look upon one light with the iris expanded, but on the other with the iris contracted—that is, when the lights are naked and untampered with by the photometer; but the photometer does not appreciate this, and so registers as if the eye had to judge of it with the same size iris at all times. Daylight is what we should take as a model—a light which is disseminated equally and softly in all directions, avoiding dark shadows and uncomfortable contrasts.

It is a mistake to consider the sun as a *concentrated speck*. We have only to think of its *bulk* with respect to the earth—its overpowering bigness—to see that it is altogether on a different footing from our puny specks of light. The bigger in volume we can make our flames and lights, the nearer we approach our great model. They may appear (like the sun) to be small viewed from a distance; but they are doing their work better, and more after his example, than mere concentrated, contracted specks. The larger and more expanded the original flame, the less difficulty—or shall I say work?—there is to diffuse the light.

What I have thus written hastily may not be a strictly scientific exposition, much less is it expressed in orthodox scientific language; but I noted in one of your letters you asked for a little "scientific imagination." I therefore venture to send you what appears to me to be a common-sense way of looking at the subject.

* See JOURNAL, Vol. LXIII., p. 1219.

English Public Lighting Arrangements.

SIR,—In the leader on "French and English Street Lighting Practice," which appears in the JOURNAL of Aug. 28, not for the first time do you call attention to the evils among us. But I venture to think that never before has your influence been given, or your exertions put forth, in so good a cause as that of endeavouring to displace the discreditable lamp-columns that we see, and to improve generally the street lighting of our towns.

I have no doubt that I love London quite as much as M. Maréchal worships Paris; and I have often times regretted that, when discussing and comparing these two cities, I have had to be dumb directly the question of public lighting was mentioned.

There surely can be no denying that our lamp-columns are, generally speaking, not designed with a view to their surroundings, and are ugly in the extreme, in addition to being in a chronic state of dirt. Under these circumstances, perhaps one ought to be thankful that they are so few and far between. And it is well to bear in mind that these faults are much more aggravated in the case of the unsightly pillars which are used for the arc lights.

But if we did not have the same design of lamp-post in Regent Street as we find in Holloway Road; if some regard were paid to the architecture of the streets; and if the columns were made with fitting appropriateness—then how glad we should be for double the number that we have at present.

And yet there is hope, I believe; for, on the Tower Bridge, what could be more artistic, or more in keeping with the bridge itself, than the beautifully designed and exceedingly well-executed columns that we see there? Let the same care and study that were shown in this case be exercised in our streets, and we need no longer be ashamed of the lighting of the greatest City in the world, nor have any fear of the removal of genuine, well-made, and ornamental gas-lamp columns, to be replaced by gigantic eyesores for the electric light.

C. E. BRACKENBURY.

7, *Drapers' Gardens, E.C., Aug.* 29, 1894.

Gas in Crematories.

SIR,—Cremation is at present the luxury of the rich; still it is surely, if slowly, making its way. Is it too much to look to gas as the fuel of the near future for the crematorium, and a properly constructed furnace, more or less portable, as the economical means whereby each town which aspires to nineteenth—or, say, twentieth—century sanitary appliances, may attain to one at least of the requirements?

Communications on this subject may have appeared in the JOURNAL; but, if so, they have escaped my notice. The matter seems to deserve attention.

W. A. HOUNSOM.

Brighton, Sept. 1, 1894.

Non-Lighting Back Burners for Gas-Fires.

SIR,—I must decline Messrs. Main's proposal, which amounts practically to a betting transaction. I have no wish to contest their patent, or to doubt their results, so far as they go. I had nine of my own gauze fire-burners in constant use for about two years in my house, working perfectly the whole time. They were not removed for any fault, but for the purpose of testing other forms. I simply stated my own experience, not with a few, but with hundreds of thousands of gauze burners, and not with tests for a number of hours, but for years. This will, no doubt, account for the difference in our opinions.

THOS. FLETCHER.

Warrington, Aug. 30, 1894.

The Uncertainty of Electric Lighting.

SIR,—On a recent visit to Keswick, I found the shops, hotels, and dwelling-houses, which ought to have been lit up with the electric light, had taken to gas as an illuminant; and that those who had trusted entirely to the electric light had fallen back on oil-lamps, &c. This in the month of August—the height of the tourist season—must have been a serious inconvenience to many of the electric light consumers. On inquiry, I was informed that the machinery was undergoing repair, and that the light had not been supplied for about a month. The Company were, no doubt, very anxious to again supply the light; and so they restarted the current on the evening of Sunday, Aug. 19. Consequently, many of the locked-up shops were brilliantly illuminated on that evening, as the tenants, not anticipating a return of the current, had not switched off the light. Did you, Sir, ever know of an instance of a gas company failing to supply gas to their customers for about a month?

A KESWICK VISITOR.

Aug. 30, 1894.

Free Water for the People.

SIR,—One of your contemporaries has an article on the above subject, which, I think, is fairly open to some criticism.

It is impossible to deny that "free water for the people" would be most acceptable to everybody; but then comes the question at whose expense the supply is to be carried out. The water companies, under statutory powers granted to them by Parliament, have incurred an enormous outlay, in the sinking of deep wells, in the construction of high reservoirs and filter-beds, and in enormous pipes (something like tunnels) for the conveyance of the water to its destination—to say nothing of the large staff of officers and workmen who are required to keep up the constant supply system, which the companies (and I am now speaking in the interest of the consumers) have so generously and so wisely carried out. But without going farther into the question of "free supply," and without describing how and by whom such supply is to be provided, is there any special reason why the water companies alone should be required to supply their stock-in-trade for nothing—any more than the railway and canal companies should be required to

supply free transit for passengers and goods (which are equally their stock-in-trade); or the butchers, beef and mutton on the same principle; or the millers and bakers, free flour and bread?

The same argument would apply also to the barristers and lawyers, surveyors and accountants. Surely they also should be required to give away their stock-in-trade; and, if I might be permitted, I should like to ask what objection there would be to a "Free Press"? The working man, who has to advertise for employment, as well as makers of pills, soap, cocoa, &c., &c., would, without doubt, hail the advent of a "Free Press" with enthusiasm.

But I could scarcely imagine a greater work than that which has been done for the Metropolis by the Water Companies; and the poor, at the present moment, practically have a "free supply" of water, since the landlords have to pay the water-rates of all small houses. The charges for the supplies of such houses are altogether on the infinitesimal principle; and if the richer portion of the community do pay a little more *in proportion*, this becomes a fair and equitable necessity if these Companies are to be compelled to supply the small houses at a rate which yields sometimes no profit whatever.

E. Chesshire, F.R.C.S.,
Member of the Society of Medical Officers of Health, London.

Aug. 31, 1894.

P.S.—In Birmingham, where I reside, the water-rate has been increased; and though the City Council have the control of the water supply, my water-rate has recently been advanced 25 per cent.

The Meter System v. Inspection for Detecting Waste of Water.

Sir,—I have carefully perused the letter of "London," on the above subject, which appeared in the Journal for Aug. 21 (p. 382); and I find that neither of the criticisms of "Waste Inspector" has been answered, while several of his statements have been misquoted. I am only interested in one question put by "Waste Inspector"—viz, Given a town of 50,000 inhabitants, fitted as a town should be, with outside stopcocks and main cocks for dividing each section or district, all houses having water-closets, and houses of the annual value of £40 and upwards having baths, what number of waste-water meters would be required for a place of this description, with the sizes, prices, cost of maintenance, and the staff required to work the system properly? The Journal is the only water-works paper published in England; and if "London" can send any reliable information on the above subject, it would be preferable to asking questions which have already been answered many times in your columns.

"Waste Inspector" has given us some data—viz., an estimate for putting down fourteen Deacon meters in a town with a population of 30,000. The amount was £800; and the annual cost, £400. This was to have effected a saving of 5 gallons per head per day. The scheme was abandoned, and a system of inspection substituted which resulted in the required saving being brought about at a cost of £200 per annum. Again, Mr. Hawksley's case at Norwich, where a reduction from 40 to 15 gallons per head per day was effected without the use of an elaborate meter system. These two cases quoted by "Waste Inspector," clearly show the possibility of dispensing with the costly waste-water meter system.

Perhaps others of your readers may be inclined to give their views as to the relative merits of the meter and inspection systems, which will be very useful.

Waste Detector.

Aug. 29, 1894.

LEGAL INTELLIGENCE.

SOUTH-WESTERN POLICE COURT.—Tuesday, Aug. 21.

(*Before Mr.* Denman.)

Edmonds v. Lambeth Water Company—The Charge for Water for Baths.

To-day the Lambeth Water-Works Company were summoned by Mr. W. E. Edmonds, the occupier of the house No. 19, Kingswood Road, Brixton Hill, for having unlawfully neglected and refused to furnish him with a proper supply of water during part of a period for which the rates had been paid.

Mr. Edmonds conducted his own case; Mr. Bodkin appeared for the Company.

Complainant stated that on the 10th of August the Water Company, without giving him any notice whatever, cut off his supply of water; giving as their reason for so doing the fact that he had refused to pay an extra charge of 2s. 6d. for a quarter's water supply for a fixed bath. He contended that this charge had been illegally demanded. He said that on the 22nd of June the sum of 12s. 10½d. was tendered by his wife as payment in advance for a supply of water for the quarter ending Sept. 29; and she received a receipt on account, upon which were written the words: "The Company do not forego the charge for the bath." He argued that the Company had no right to summarily cut off the water without an order from a Justice; adding: "The Company have practically admitted to me that the bath-tax is not legal."

Mr. Denman said this was not correct. There was no question whatever that the complainant was liable to pay some amount for the extra supply of water to his fixed bath. The point for discussion was whether they were entitled to cut off the entire domestic supply.

In cross-examination, complainant said he first disputed the charge for the bath about December, 1892. He admitted that on the 6th of June he received a printed notice that, if he continued to use the Company's water for his fixed bath without paying 2s. 6d. a quarter, the supply would be cut off.

Mr. Bodkin remarked that his point for the Company was that the complainant had not shown himself to be a person legally entitled to receive a supply of water to his house, for two reasons: The first was that he had not paid the water-rate in advance, and therefore, under section 74 of the Water-Works Clauses Act, 1847, was not entitled to water; and the second was that he had rendered himself liable to the penalties specified in section 32 of the Metropolis Water Act, 1871, as he had done something disentitling him to a supply of water.

Mr. Denman: On the ground of waste?

Mr. Bodkin: No; on the ground of improper use of the water. Counsel proceeded to say that the Company were only required to supply water for other than domestic purposes on agreement, which must be express or duly implied; and it was perfectly clear after Mr. Justice Chitty's recent decision* that water for a bath—for a fixed bath, at any rate—was not included in the amount for a domestic supply, which was calculable on the annual value of the premises. The continued use of water for a fixed bath was, he argued, a tacit agreement to accept the Company's supply of water for the purpose, at a fair charge. If the complainant, before Midsummer last, had tendered a reasonable sum for the non-domestic supply, in addition to the ascertained legal charge for the domestic supply, the Company would have been unjustified in cutting off the water. He took the line, however, that the bath charge was absolutely illegal, and refused to pay it altogether. His (Mr. Bodkin's) second point was that the complainant was not entitled to receive a supply of water, by reason of his contravention of the provisions of section 32 of the Metropolis Water Act, 1871. The complainant had gloried in his misuse of the water, and had declared that he would continue it; and the Company were, therefore, fully justified in using their powers and cutting off the supply of water from his house.

Mr. Denman having invited Mr. Edmonds to address him in reply,

Complainant said he was still unable to see any justification for the summary way in which his water had been cut off. It was against public policy to put in the hands of any trading company such powers as the Lambeth Water Company claimed to exercise.

Mr. Denman: Assuming that to be as you say, we have only to decide whether Parliament has or has not given them the power.

Complainant: I say that Parliament never would give any body of men, however good, just, honest, and straightforward they might be, power to render any house uninhabitable by cutting off the water.

His Worship reserved his decision, in order to put it in as precise language as possible.

Monday, Aug. 27.

Judgment was delivered in the above case to-day.

Mr. Denman said the complainant had at his residence a fixed bath, for which, up to 1892, he regularly paid in advance the charge of 2s. 6d. a quarter. Since then he had declined to pay; contending that the supply for "domestic purposes" was intended by the Legislature to include a supply for every use in the house. Last spring, however, Mr. Justice Chitty laid it down, in the case of *Walker v. Lambeth Water Company* that the plaintiff was only entitled to have a supply of water for a fixed bath upon such terms and conditions as should be agreed upon between him and the Company. The Company had never contended that the ordinary domestic tub or hip bath required extra payment. After receipt of notice in June of the Company's intention to cut off the supply to the house if the bath were not paid for, the complainant paid 12s. 10½d., as he said, for the domestic supply only, up to Michaelmas; and he was given a receipt "on account." In August, no further payment having been made, and the bath being still used, the Company cut off the whole supply, for which act, as Mr. Edmonds alleged, they rendered themselves liable to a penalty. Section 74 of the Water-Works Clauses Act, 1847, authorized them to take this course where any person who is "liable to pay the water-rate" neglected to do so. Section 3 defined the expression "water-rate" as including any "rent, reward, or payment," to be made for a supply of water by the undertakers. It was clear the complainant had neglected to pay such "rent, reward, or payment" due from him; and he could not be allowed to defy the Company simply because he did not like their charges. By using the water after the receipt of the notice, he entered upon an implied contract under section 32 of the Metropolis Water Act, 1871. Under these circumstances, the summons would be dismissed, with £3 3s. costs.

A Large Gasholder at Rochdale.—A new gasholder for the Rochdale Corporation Gas-Works has recently been completed by Messrs. S. Cutler and Sons; and the experiments which have been made to test it have proved successful. The gigantic structure is about the most conspicuous object in the town; for it is 120 feet in diameter and 136 feet high.

The Electric Light for Nottingham.—The Nottingham Corporation electric light station is practically completed; and it is expected that the inhabitants who are desirous of lighting their premises by means of electricity will be able to do so in about a fortnight's time. The charge has been fixed at 6d. per unit. At present the Corporation do not intend to supplant the public gas-lamps by the electric light; but later on the streets in the heart of the town will be lighted by arc lamps. The amount spent upon the scheme has been, in round figures, £50,000.

Artesian Wells for Town Water Supplies.—The new works in course of construction by the Oakland (California) Water Company for supplying that town will derive their water from six artesian wells about 20 miles from the city, four of which have been in use for some years. These wells flow at the rate of 10 million gallons a day at the surface, and at a much greater rate 8 feet below. In sinking them, an 18-inch tube was first driven through the top soil into a clay stratum about 40 feet down, and then a 14-inch tube was put down inside it; the space between the two being filled with concrete. Inside this well a 10-inch tube was then sunk to the water-bearing stratum; the flow of water being controlled by a gate on the top and one on the side 8 feet below the surface. There will be two pumps, each of 600-horse power. The main conduit leading to the city is 30 inches in diameter, and is made of riveted plates, built in 30-feet sections, and coated with asphalte before laying. The trenching is light; the average cut being about 5½ feet.

* See Journal, Vol. LXIII., p. 714.

MISCELLANEOUS NEWS.

PROJECTED EXTENSION OF THE WATER-GAS PLANT AT THE BELFAST GAS-WORKS.

Report to the Gas Committee by Mr. Stelfox.

As already intimated in the JOURNAL, an important extension of the water-gas plant at the Belfast Gas-Works has been under the consideration of the Gas Committee; and the report they presented to the Council, by whom it was adopted last Saturday, was accompanied by the following appendix, submitted to them by the Gas Engineer and Manager (Mr. J. Stelfox) setting forth his proposals:—

It will be in the recollection of most of the members of the Committee that the erection of the carburetted water-gas plant at the gas-works was decided upon in order to meet the immediate wants of the city at a time when difficulties had cropped up as regards the acquisition of ground for the extension of the works. It was understood the question of extension should be laid aside pending the result of the experiment; and it was hoped that the new system would effect a saving by rendering the use of cannel unnecessary, while at the same time it would increase the producing power of the station, and to some extent relieve the congestion of the coke banks. Beyond this, no advantages were looked for. The results of some nine months' experience of the actual working of the plant have, however, not only served to confirm all these anticipations, but have shown that gas can be made by it with an ease and economy which had not been reckoned on. This result has been largely due to the reduction in the price of oil. When the plant was ordered, the price of this important element in the cost of the new gas was about 3¼d. per gallon. At this price it would be a most economical substitute for cannel in the enrichment of ordinary coal gas. However, by the time we were in a position to arrange for a supply of this raw material, we were able to purchase at 2¼d. per gallon. The result has been that we have not only been able to afford an increased illuminating power in the gas supplied, but also to effect an economy even as compared with the gas produced from common coal.

The subject of water gas has been brought so prominently before you lately in the papers, that I do not propose to trouble you with any repetition of statistics with which you are doubtless familiar. My present object is to call your attention to the desirability of arranging for a gradual extension of the new system, and to suggest a scheme for carrying this out in such a way as to effect great economy in the future production of gas.

My proposal is as follows: The retort-house in the old section of the works consists of three benches of retorts, each capable of producing, under the very best conditions, about 900,000 cubic feet of gas per day. The desirability of having these benches reconstructed on the regenerative system (such as has been carried out in the new retort-house) has been long realized; but it has been found impossible to effect the desired change, owing to the fact that we could not dispense with any portion of the producing plant during the winter season, and were unable to effect the necessary changes in a single summer. Consequently, retorts had each season to be reset in the old arches, in order to meet the winter demand. These benches are now very nearly ready for complete renewal. My recommendation is that, instead of expending money in reconstructing them as coal-gas benches, we should arrange to turn this old retort-house into a producing-house for the manufacture of carburetted water gas. The alteration in the building would not be so great as would be required for its conversion into a regenerative retort-house; and as regards comparative outlay, efficiency, and economy of working, an enormous advantage would accrue by the adoption of the proposed change.

In support of this statement, I will ask your careful consideration of the following: Three benches of retorts, with houses too narrow to admit of the use of any of the modern retort-house machinery, and necessitating the continuance of hand-rake and shovel work, would produce per day 2,700,000 cubic feet. The same space will afford ample accommodation for water-gas plant equal to the production of 14,000,000 cubic feet per day. The cost of reconstructing one of these benches on the regenerative system of setting would be about £9000; and the daily production of gas from this would be, as already stated, 900,000 cubic feet. In less than the space occupied by this bench, water-gas plant can be constructed equal to the production of 3,500,000 cubic feet per day, at a cost of £18,500,* which includes every item necessary for the production of the gas, except the alterations of the building and the cost of the boiler and blower house, for which there is space on the site of the old store, destroyed by fire a few years ago.

All the apparatus connected with this section of the works—condensers, exhausters, scrubbers, purifiers, and meters—would be available, without the least alteration, for the working of the new system; and even the cost of a compensating gasholder can be dispensed with by utilizing for this purpose one of the existing holders. I may state that the erection of a new gasholder (very much needed, if we are to go on with coal gas) might, by the carrying out of my proposal, be deferred for some years; and this would be a very important saving, as the cost of a holder adequate for the requirements of a community such as ours would not be less than £70,000 to £80,000.

I submit for your information a plan showing the present retort-house and the proposed alterations thereto, and also the estimate of Messrs. Humphreys and Glasgow for the supply of all the necessary plant. I think it is very desirable that the order should be given for the latter at once, so that we might have the use of it for the winter of 1895-6. The remarkable economy shown with oil at 2¼d. per gallon affords the very brightest prospects for economic results, now that we have been able to purchase our supply for two years ahead at 2d. per gallon; and I strongly recommend the Committee to give their prompt approval to the proposed changes.

* In a paragraph which appeared in the JOURNAL last week, it was by mistake stated that the expenditure of the £18,500 would ensure the production of 900,000 cubic feet of water gas per diem. This, as will have been seen from Mr. Stelfox's report, was the quantity of coal gas the division of the retort-house proposed to be altered could produce.—ED. J.G.L.

CROYDON COMMERCIAL GAS COMPANY.

The Annexation of the Carshalton Company.

The Half-Yearly Meeting of the Croydon Gas Company was held last Wednesday, at the Offices, Katherine Street, Croydon—Mr. C. HUSSEY in the chair. In view of the interesting character of the business to be transacted, an unusually large number of shareholders assembled.

The SECRETARY (Mr. W. J. Russell) read the notice calling the meeting; and the Directors' report and the accounts of both the Croydon and Carshalton Companies (of which the most prominent features were given in our last issue) were taken as read.

The CHAIRMAN said, in rising to propose the first resolution, he felt a greater amount of responsibility than he had done on any previous occasion. Since the shareholders assented, on Feb. 21, to the amalgamation of the Croydon and Carshalton Companies, a good deal of work had been accomplished; and he was pleased to say that the Bill which they promoted had passed through Parliament more quickly than they had anticipated. It had taken nearly two years to conclude negotiations with the Directors of the Carshalton Company. The Board, however, believed they had succeeded in bringing to a happy conclusion a thing which would be not only satisfactory to the Directors and shareholders of the Carshalton Company, but they had made a bargain with them, and had now an Act of Parliament, which would be beneficial to the shareholders and consumers of Croydon. As the shareholders were aware, their great aim in getting this Act was to procure an increase of capital, because their old capital was nearly exhausted. They would have had any way to go to Parliament for capital in a short time; and when a gas company went to Parliament for extra capital, they did not now get it on the same terms as formerly. Well, they had obtained the Act; and it must be considered one of the best Acts in the United Kingdom. They had been enabled to add, by the amalgamation, the sum of £70,000 of capital, exclusive of debentures, which were fixed at £25,000. The Directors expected that the £70,000 of capital would realize a premium of something like £40,000, which gave them altogether a capital of £135,000 to deal with before it would be necessary to go to Parliament again for further capital. He thought they were all agreed that this was an excellent thing accomplished. When the Directors applied to the shareholders for permission to promote the Bill, they did not then expect it would be got through Parliament without some opposition from the Local Authorities. Through the good services of their Solicitor (Mr. E. K. Blyth), the Bill had actually become law six months earlier than was anticipated—viz., on July 1 this year, instead of Jan. 1, 1895; so that they would be reaping the extra benefit of supplying gas in the Carshalton district during the current half year. The manufacture of gas for that district at the Croydon works would not commence for a month or two, or, at all events, until they could get the new trunk main finished. The slight opposition which they did receive to the Bill arose from two quarters. First, from the Croydon Corporation, who consulted Mr. Corbet Woodall, C.E. After perusing the Bill, the only thing that gentleman could suggest to the Corporation was that the Company should call up the £12,500 they had of the Carshalton Company's debentures before they made a call on the shares. So far as the Croydon Company were concerned, this was a thing they desired, because they could issue debentures much cheaper than ordinary shares; but they had to consult the Carshalton Company, as it would somewhat delay the calling up of £8 per share on 2500 of their £10 shares. It was a very small matter; and the Directors of that Company therefore wisely gave way. The Corporation also stipulated that, for ten years, the price of gas in the Carshalton district should not be 1s. more or 6d. less than the price charged in Croydon; and to this the Directors of both Companies readily agreed. Then they also had some slight opposition from the Carshalton Local Board; but that was met and overcome in a satisfactory way to all parties. Turning to the business of the Croydon Company, the Chairman remarked that the sale of gas for the six months showed an increase of 5·91 per cent., or 13¾ million cubic feet, as compared with the corresponding half of 1893. He thought this must be considered very satisfactory, as it was evidence that they were still progressing. This increased consumption was equal to an addition of £1880 to the revenue. Residuals also exhibited a good increase, with the exception of tar. Coke had been exceedingly good; the average price realized having been 2d. per cwt. over the corresponding period of last year. He should like to explain that they attributed some of the increase in the sale of coke to the regenerative furnaces which they had erected, and which answered exceedingly well; and every anticipation they had formed of them had been more than fulfilled by the extra amount of fuel they had saved. Regarding sulphate of ammonia, this had fetched £496 more than in the June half of last year. This was partly accounted for by the extra make, and by the average price obtained—£12 17s. 6d., as against £10 19s. 2d. The amount available for division was £19,667; and the Directors recommended that the usual dividends be paid. He might here mention that the interest on the insurance and reserve funds had been added to those funds instead of transferring it to the revenue account, as had sometimes been done previously. After paying the dividends—amounting to nearly £12,000—they would have a balance of £7668 to carry forward, which was more than enough to pay half the dividend of the current six months. Still dealing with the Croydon Gas Company's affairs, they had supplied 120 additional gas cooking-stoves, making the total number on hire 2573, besides which a great many had been purchased by consumers. They had also fitted up 114 additional cottages on the prepayment meter system. The total number of ordinary meters in use was now 7894; and of prepayment meters, 922. They had expended a large sum out of revenue on repairs and renewals of manufacturing plant and mains—viz., £2150; on meters, £462; and on stoves, £268. Dealing with the question as to the fairness of charging rental for meters and stoves, the Chairman pointed out that, if they did not make this charge, the price of gas would have to be raised; so that the Board thought it better to adhere to the present plan. Continuing, he said that, since the previous meeting, the

Directors had sold by auction 500 new ordinary shares of £10 each, which had realized £22 9s. 4d. per share. This was the highest price they had obtained for some time, which showed that the Company still held the good opinion of the public. On the 500 shares, they had received a premium of £6080 18s. 9d. It would thus be seen that the Company obtained their capital at about 4¼ per cent., as near as possible; and no one could buy the shares to pay him 5 per cent. As to the works, since the last meeting of the shareholders, contracts had been entered into for the construction of a large gasholder and tank, which had been rendered necessary by the increase in the business. Their Engineer (Mr. J. W. Helps) had worried the Directors regarding this matter from time to time; and at last it became imperative that they should have additional storeage. The present storeage was only equal to 80 per cent. of the consumption; while they ought to have above 100 per cent. This was not a nice position to be in—indeed, he knew that, during the winter before last, their Engineer was making gas and sending it out as fast as he could, with nothing in the holders at all; and this was not the position that a Company like theirs should be in. As would be seen from the report, the Directors had decided to reduce the price of gas in Croydon from 2s. 10d. to 2s. 9d. per 1000 cubic feet from the Midsummer quarter. They had not done this without due consideration. As he had said, they had a balance of £7668 to carry forward, and the coal market looked more settled than it had done for some time past; and, besides, the Directors felt justified in making the reduction for two other reasons: First, they believed the shareholders were satisfied with the dividend they were receiving; and, secondly, they thought they ought to reduce the price as much as they could, in order to show a common front to the electric light. There was not the slightest doubt that the lower the rate at which they could sell gas, the longer would be delayed the introduction of the electric light into Croydon. Turning to the affairs of the Carshalton Company, he said that the accounts showed an increase in the sale of gas; and he added that since the accounts had been made up, they had had very favourable reports from their Engineer as to the increased consumption already in the district. They had brought the price down from 4s. 6d. to 3s. 6d.; and consequently they expected there would be a considerable increase in the consumption, and they were not disappointed. Referring with great regret to the retirement from the Board of Mr. William Hyslop, the Chairman stated that that gentleman had been one of the Directors since the formation of the Company in 1847; and he had rendered signal service for nearly 50 years. At the previous meeting, Mr. Hyslop took the opportunity of saying that he felt the time had arrived when he must retire; and it was with the greatest regret that, shortly afterwards, the Board received his resignation, and they did all in their power to get him to remain. At the last meeting, too, Mr. Hyslop expressed his opinion that they ought to have a gas engineer on the Board; and the name he mentioned was that of a gentleman who was well known and much respected in the gas world. Mr. Hyslop's recommendation was duly considered by the Directors; and they ultimately elected Mr. Corbet Woodall to fill the vacancy. Already they had received from him some valuable suggestions, which he (the Chairman) believed would lead to the benefit of the Company. There was one other matter to which he wished to refer. As new certificates must be issued to the shareholders, the Directors thought this would be a convenient opportunity of converting the seven classes of shares into three classes of stock, according to their respective statutory rights. To the shareholders this change would make no difference; but it would greatly facilitate the work in the office. He concluded by moving the adoption of the Croydon Company's report and accounts.

Mr. ALLAN J. LAMBERT seconded the motion.

Mr. HOVENDEN and Mr. HILL expressed the opinion that it would have been more courteous for the Board to have submitted the question of the election of a new Director to the shareholders before appointing Mr. Woodall; and the first-named gentleman inquired whether, before his election, he was a registered proprietor of stock sufficient to qualify him for a seat.

The CHAIRMAN replied that he was; and, in answer to another inquiry, he stated that the Directors would, after the conversion of the shares into stock, consider the question of applying for a Stock Exchange quotation.

The motion was carried; and dividends for the half year were afterwards declared at the rates per annum of 14 per cent. on the capital of £51,600, and 11 per cent. on the capital of £152,500, less income-tax.

Mr. G. J. B. JACKSON, the late Chairman of the Carshalton Gas Company, in moving the adoption of the half-year's accounts of that concern, pointed out that the profit on revenue account amounted to £1425, or rather more than sufficient to pay the dividend recommended—viz., at the rate of 9 per cent. per annum. This would absorb £1350, and leave a balance of £75. He thought that a great matter for congratulation was the fact that the Carshalton consumers were now obtaining gas at 1s. per 1000 cubic feet less than they were before the amalgamation.

Mr. S. SPENCER seconded the motion, which was agreed to.

A dividend on the Carshalton capital at the rate of 9 per cent. per annum (less income-tax) having been declared,

Resolutions were passed, re-electing the Directors who retired pursuant to the new Act—viz., Mr. A. J. Lambert, Dr. T. R. Adams, and Mr. G. J. B. Jackson.

On the proposition of Mr. MARTIN TAYLOR, seconded by Mr. CHAPMAN, the remuneration of the Directors was fixed at £1450 per annum from the 1st of July last; this sum to include £50 to be paid to the Chairman for the time being for additional services rendered in that capacity.

The joint fees of the Auditors were subsequently fixed at 80 guineas per annum from July 1.

Mr. CORBET WOODALL next moved—"That, in pursuance of section 9 of the Croydon Gas Act, 1894, and section 61 of the Companies Clauses Consolidation Act, 1845, the shares of the Company representing the shares of the Croydon Company as existing prior to the amalgamation which have a standard dividend of 10 per cent. (namely, the first, second, and "A" 1871 capital shares) be and the same are hereby converted into a consolidated stock, with the same standard dividend, to be called the "A" stock of the Company; and that the shares of the Company representing the shares of the Croydon Company as existing prior to the amalgamation which have a standard dividend of 7 per cent. (namely, the third, "B" 1876, and fourth capital shares) be and the same are hereby converted into a consolidated stock, with the same standard dividend, to be called the "B" stock of the Company; and that the shares of the Company representing the shares of the Carshalton Gas Company as existing prior to the amalgamation, upon which the whole amount subscribed has been paid up, be and the same are hereby converted into a consolidated stock having a standard dividend of 7 per cent., to be called the "C" stock of the Company." Mr. Woodall said he believed this resolution was proposed rather with the object of simplifying the accounts and the method of keeping the registers of the Company than for any effect it was likely to have upon the value of the property of the shareholders. He knew there was some difference of experience as to the result of converting shares into stock. In some cases, it had had the effect undoubtedly of increasing the value; but, in some others he happened to know of, it had had rather the contrary effect. This was one of the changes which was inevitable as the result of the growth of the Company. Having now seven classes of shares, the difficulty of dealing with transfers had become very great; and a consolidation of this sort was without doubt called for. Before moving this resolution, he felt under an obligation to say a word or two of a personal character. The Chairman had referred to the fact that he had had something to do with advising the Croydon Corporation with regard to the opposition to the Bill of the Company. That was quite true; but he felt it was necessary to say that, at the time he was invited by the Corporation to aid them in this matter, no suggestion had been made to him to accept a seat on the Board of the Company. It would be a great mistake to suppose that the action of the Corporation was inimical to the interests of the Company. The Corporation had only fulfilled their duty in watching over the interests of the gas consumers; and as far as he had had an opportunity of observing on previous occasions, not one particle of ill-will or desire to injure the property of the Company influenced them in the action they took.

Mr. J. SLATER seconded the motion.

Mr. B. GREEN remarked that he thought the Directors were doing a wise thing in taking the step proposed in the resolution. He happened to have had some experience with a company in this matter; and they found that it facilitated the business of transfer very greatly, and did not result in any depreciation of the stock.

The motion was unanimously carried.

Two other resolutions were also unanimously passed—the first, agreeing that all transfers of consolidated stock should be in sums of £5 and multiples thereof; and the second, authorizing the borrowing on mortgage of £12,500, which, by section 40 of the Carshalton Gas Act, 1887, that Company were empowered to borrow, such power being now vested in the Croydon Company.

The services of the Chairman and Directors and the officials were next acknowledged; special reference being made to the arduous duties which had devolved upon them all in connection with the amalgamation, and to the additional work which had fallen to the lot of the Engineer in carrying out the important extensions at the works.

TOTTENHAM AND EDMONTON GAS COMPANY.

The Ordinary General Meeting of this Company was held last Saturday week at the Offices, Willoughby Lane, Tottenham—Mr. GEORGE GRIPPER in the chair.

The SECRETARY (Mr. J. Randall) having read the notice convening the meeting,

The CHAIRMAN submitted the report and accounts for the half year ending June 30 last. Before, however, formally moving their adoption, he said that, in accordance with the wishes expressed by the proprietors at the last meeting, a letter was written to their late Director (Mr. J. Malcolm), thanking him for the faithful services he had rendered the Company during his long term of office; and, on his decease (which occurred shortly after), his Executor wrote to the effect that Mr. Malcolm had been highly gratified with the kindly feeling shown him by the proprietors. Proceeding, the Chairman said the report showed that the Company were in a much better position than they had been for some time, both as to the quantity of the gas sold and the returns. They found that the consumption of gas was 6·32 per cent. in excess of the quantity in the corresponding period of 1893. This was a very satisfactory growth, because, in the June half of last year, they had a decrease of some 2 per cent. The number of consumers had also largely increased; and the good result in the sale of gas was to a considerable extent due to the prepayment meters which they started fixing about eight months since. They had now about 600 of these meters in use; and it was found that they were very popular. The total number of meters in the district was 6003 (of which 5403 were ordinary, and 600 prepayment ones)—the net increase in the half year being 655. The cooking-stoves on hire had also increased considerably; the number now being 735, which was an addition of 172. On coke and the other residuals, there had been a marked improvement. From coke, they had obtained £1032 more than in the corresponding period of last year. From sulphate of ammonia, £202 more was received; and he was very glad to see that the price continued to rise a little. Breeze returned £42 more; and tar, £68. They had therefore obtained about £1400 extra from residuals, which was a grand increase, because, whether or not they realized an additional return from them, the cost of the labour was the same. Another matter to which he wished to refer was that they formerly had some bondholders who held terminable 4 per cent. bonds, which became due at varying periods; and the Directors felt that it would be an advantage to bring them all under one denomination, by converting them into 4 per cent. perpetual debenture stock. They therefore gave the holders of the bonds the option of converting them in April last; and he was pleased to say they all availed themselves of it. The Directors had also decided, in order to pay for new works, to sell by auction in September, £6000 of 4 per cent. perpetual debenture

stock. They found that the value of this stock was increasing very considerably; and so they had registered it at £119—19 per cent. premium. The new manufacturing plant and works were progressing satisfactorily. This plant, as was stated at the last meeting, was necessary for the increase of the business. The Directors had also considered very carefully the question as to the utilization of water gas; and they came to the conclusion that it was the best and cheapest thing they could adopt, and so plant was now being erected. It would have required four times more outlay of capital to put up a new retort-house; and the carburetted water gas would do away with the use of cannel, the price of which had been increasing to an immense extent. As to the profit and loss account, that was in a very satisfactory position. With the £67 brought forward, they had an amount available for division of £7321; and, after paying the dividends proposed, £479 would remain to be carried forward. The Directors hoped that this was the beginning of the building up of that balance which they had some years ago, and which had been gradually brought down. He then moved the adoption of the report and accounts.

Mr. HALL said that it was very gratifying to hear the Chairman's remark regarding the premium on the debenture stock; but he thought it would have been a fairer course to have allotted the stock among the proprietors. He knew it could not be done this time; but perhaps the Directors would do so on a future occasion.

The CHAIRMAN pointed out that the Board were bound to put the stock up to public competition.

Mr. CORBET WOODALL, in seconding the motion, said he believed this was the first time since 1887 that, in the half year ending June, the Company had earned the dividend paid. They might therefore regard this as a special and extraordinary occasion, upon which they might congratulate each other. The Chairman had stated that the Directors were now engaged in the building of additional producing plant. As the proprietors were perhaps aware, the manufacturing plant of a gas company was occupied to its full extent for a comparatively short time of the year—about three weeks it might be just in the midst of winter. At that time, in their own case, they were practically using every retort on the premises, so that the expenditure of capital had not been entered upon with undue haste. Clearly, inasmuch as the use of the whole plant was only required for this short time, it was very desirable that the provision for that time should be made at as cheap a rate as possible; and they were able, by means of carburetted water gas, to erect apparatus that would give them all they needed during that short period at a much less cost than would be required for building a retort house and settings in the ordinary way. This plant, too, was available for use at three or four hours' notice in case of fog or other cause; whereas the coal retorts needed about four days to bring them into satisfactory operation. On these grounds, as well as the fact that carburetted water gas was more economical than the method hitherto followed of enriching the gas by cannel, it was obviously to the interest of the Company that this system should be adopted.

The motion was carried unanimously.

Sir H. CARTWRIGHT proposed the declaration of dividends at the rates per annum of 11½ per cent. on the "A" stock and 8½ per cent. on the "B" and "C" stocks, less income-tax; and, in doing so, he congratulated the proprietors upon having earned the amount required for this purpose during the half year. Since the end of June, they had, he said, evidence that the consumption of gas was continuing to increase; and this gave them good hope for the future—indeed, he thought they might fairly anticipate that not only would the present dividends be maintained, but that they might by-and-bye, under the operation of the sliding-scale, be improved. When it was remembered how disappointing the last few years had been in the case of other classes of industrial undertakings, he thought they might congratulate themselves on the position they occupied. Especially to those who had held their shares from the beginning, irrespective of all the complications and disasters that had been predicted with regard to gas-works, there must be great satisfaction in realizing these returns.

Mr. J. WARREN seconded the motion, which was agreed to.

Resolutions were then passed re-electing the retiring Directors (Mr. J. Warren and Sir H. Cartwright) and Auditor (Mr. G. T. Watson).

The Directors having been thanked for the attention they bestowed upon the business,

The CHAIRMAN responded; and, in doing so, he observed that they had now an odd 2d. in the price of gas (3s. 2d.) which the Directors would like to see vanish. Their feeling, however, was that, before they reduced the price, they ought, if possible, to build up a reserve again, in order to maintain the dividends at the uniform rates of 11½ and 8½ per cent.

A vote of thanks was also passed to the Secretary and the Engineer (Mr. W. H. H. Broadberry) and their respective staffs, and both gentlemen replied. The latter made the interesting announcement that since the end of the half year the number of prepayment meters fixed had mounted up to above 900; and he contrasted the freedom from accident of working people who adopted this convenient means of obtaining light and the danger to which those who used oil-lamps were ever exposed.

PROVINCIAL GAS AND WATER COMPANIES.

From the reports and accounts which came to hand last week, we have extracted the information contained in the following paragraphs.

Gas Companies.

Addressing the shareholders at the meeting of the Derby Gas Company last Wednesday, Mr. H. Swingler, D.L., J.P., said his statement was a sort of interim report; copies of the accounts not being issued, as they preferred to wait until the end of the financial year. But at the same time, he was delighted to say that the half year's accounts had turned out very satisfactorily—a fact which he was sure the shareholders would be pleased to hear. At the time of the last meeting, they were in the midst of the coal strike; but they now appeared under different circumstances, although they had in the meantime placed themselves in such a position as to be able to meet any similar emergency that might arise, and had laid in a stock of coal amounting to 12,000 or 15,000 tons. With regard to the supply of gas, he was pleased to say the revenue kept up, although the quantity consumed had rather diminished; but this was accounted for to a very great extent by the weather in the latter part of the half year, and by trade generally being so bad. In addition to this depression, they had another charge constantly pressing upon them, and that was the increase of rates, which every half year he had to lament. In accordance with the promise made by the Directors, the price of gas, which was raised during the coal dispute, had been reduced to its usual figure. There was another item in their business which had given them satisfaction. That was the system of letting out gas cooking-stoves on hire; and he was pleased to say that this branch of their business was increasing every month. They had now 300 cookers fixed in different parts of the town, besides a large number of fires. With reference to the capital account, they had expended £1800 during the past six months. The sale of gas had increased by £224; and residuals had made the marked advance of £1101. On the manufacturing side they had made less gas, and had naturally consumed less coal; and they were able to show a decrease on this side in wages, purifying materials, &c., of £1876. They did not, however, do this at the expense of the concern; the amount they had spent during the six months on repairs and maintenance having amounted to £2309, against £2131 in the June half of last year. With regard to rates and taxes, the increase had been £287; the total amount paid being £1599, as compared with £1312. Taking it altogether, he thought the shareholders would agree with him that their position was very satisfactory indeed.

Reporting upon the affairs of the Douglas Gas Company at the meeting of shareholders on Monday last week, the Directors stated that the profits showed an improvement; the returns from residuals having been especially gratifying. Including the balance brought forward from the previous half year, there was available £3897, out of which would be paid a dividend of £1 7s. 6d. per share. Referring to the death of Mr. William Smith, who was for thirty years Manager, the Directors stated that they had appointed the present Secretary (Mr. C. Kay) to fill the two positions. The report was adopted.

At the half-yearly meeting of the Eastbourne Gas Company yesterday week, it was reported by the Directors that there was a net profit for the six months of £6760, which, added to £7824 brought forward and £94 received from the bankers for interest, gave a total sum of £14,678, of which, having regard to the sliding-scale prescribed by the Company's Act, and the price of gas charged during the half year, the sum of £5605 was available for dividend; leaving a balance of £9073 to be carried forward to the next accounts. The Directors therefore recommended that a dividend for the half year be declared at the rate of 13 per cent. per annum on the £20,000 original capital and on the £12,490 (the amount raised on "C" shares), and at the rate of 10 per cent. on the £65,000 paid-up capital raised on "B" shares. The Chairman (Dr. G. A. Jeffery), in moving the adoption of the report, said the profit represented an increase of £1692 upon that for the corresponding half year. This was accounted for by the larger sale of coke and residuals, the increase in rents, and the saving in law expenses. There had also been a greater consumption of gas to the amount of 4,285,000 cubic feet, which was a little more than 4 per cent. The coal used was 9840 tons, as against 9409 tons in the corresponding period. After pointing to the gradual reduction in the leakage from 4·5 per cent. in 1890 to 2·8 per cent. this year, he mentioned that there had been a saving on coal of 1s. per ton; the price being 16s. 6d., as against 17s. 6d. The coke had also fetched a higher figure—the return being 7s. 10¾d., as against 6s. 7¼d.; and there was a small increase in the receipts for tar. With respect to sulphate of ammonia, there had been a better price and an improved output. The sale of gas for the whole year was 202,780,000 cubic feet; and the Directors proposed to reduce the price 2d. per 1000 feet, as from July last. The motion was unanimously carried.

The annual meeting of the Hartlepool Gas and Water Company was held last Thursday; and, in the course of his remarks, the Chairman (Mr. W. H. Fisher, congratulated the shareholders upon the success of the year's operations. There had, he said, been a material advance in the consumption of both gas and water; and, but for the increase in working expenses, the balance would have been larger. Rates and taxes had also increased by £400 since last year; but the receipts for residuals, especially sulphate of ammonia, had been highly satisfactory. The sale of gas had been very good; but the expenses caused by last year's drought had proved prejudicial to the water revenue. The extension of the works at Hurworth Burn was making favourable progress; and the boreholes for water at West Hartlepool had proved quite equal to expectation. He concluded by moving the adoption of the report, and the payment of a dividend for the past half year at the rate of 7½ per cent. per annum on the "A" and "B" shares, and 7 per cent. on the "C" and "D" shares, in all cases clear of income-tax; leaving £230 to be carried forward, after replacing £958 deducted from profit and loss account last year. The motion was adopted.

The Directors of the Hastings and St. Leonards Gas Company will have the pleasing duty, on Thursday next, of presenting a satisfactory report on the working of the undertaking in the six months ending June 30 last. There is a profit balance of £8510, which, with the amount brought forward, will make the substantial sum of £36,533 to be dealt with by the shareholders. Out of this it is proposed to pay dividends at the rates of 12 and 9 per cent. per annum, and to carry forward the balance. The accounts accompanying the report show that the sale of gas produced £27,818; the rental of meters and stoves, £1209; and the sale of residuals, £8184—the total revenue being £37,328. The manufacture of gas entailed an expenditure of £24,465 (coals figuring for £13,295, and the duty thereon paid to the Urban Sanitary Authority amounting to £1965); the cost of distribution was £1394; management expenses came to £1126; and the total outlay was £28,817—leaving £8511 to go to the profit and loss account. With regard to the working, which is under the supervision of Mr. C. E. Botley, Assoc.M.Inst.C.E., the Company's Engineer and Manager, 16,274 tons of coal and 238 tons of cannel were carbonized or used in the six months reported upon; the make of gas being 168,821,000 cubic feet, of which 161,377,800 cubic feet were sold. The quantities of residuals produced are estimated as follows: Coke, 10,165 tons;

breeze, 857 tons; tar, 151,024 gallons; ammoniacal liquor, 345,849 gallons. These were disposed of thus: Coke used in manufacture, 1966 tons; coke sold, 8342 tons; breeze sold, 860 tons; tar sold, 161,024 gallons; ammoniacal liquor sold, 300,849 gallons. In the past half year, the expenditure on capital account (which amounted to £212,114 on Dec. 31 last) was increased by £3363, of which £2453 was for new buildings and plant, and £283 for new meters. This outlay raised the total expenditure to £215,477, which is £3124 in excess of the amount of capital called up, with the premiums thereon. The Company, however, have £54,117 of share, and £13,529 of loan capital still available for the purposes of the undertaking. Arrangements have been made for the reconstruction, during this and next year, of one of the gasholders. Prepayment meters have been introduced experimentally, and with gratifying success; showing that there is a considerable demand for gas among small consumers.

At the annual general meeting of the Heckmondwike Gas Company on the 24th ult., the Directors submitted the accounts for the half year ending June 30 last, which showed a profit of £1252. Adding the balance brought forward (£2997), there was produced a sum of £4249; but as £1174 had been used for paying the interim dividend in March, there was left a balance of £3074 available for distribution. This allowed of the full statutory dividends being paid, with a balance of £1260 to go forward. The amount in the reserve fund was £6300. In their report, the Directors recorded a gradual increase in the consumption of gas for cooking purposes, stimulated by the exhibition of gas appliances held in April last. In conjunction with the Manager (Mr. A. F. Goodson), they have been giving special attention to the reduction of the leakage; and, with this object, they have expended a considerable amount in improving the distribution plant. The accounts submitted to the proprietors included an interesting statement showing the working results for the past and the preceding twelve months. The figures reflect much credit upon the Manager, inasmuch as the same quantity of gas was made last year as in 1892-3—83,695,100 cubic feet in the former, and 83,715,300 cubic feet in the latter year—with 1035 tons less coal; while of the total production about 2 million cubic feet more, in round numbers, were sold. The effect of the attention bestowed on the mains is apparent in the reduction of the percentage of leakage from 21·52 to 18·83. In regard to the residuals, the quantity of tar produced last year was 39 tons in excess of that for the year 1892-3—the yield per ton of coal being increased from 9 to 11·13 gallons; and though the bulk of coke made was necessarily less, the amount saleable was 8½ cwt., as compared with 7½ cwt.

The Directors of the Keswick Gas Company will to-day present to the proprietors a report on the working of the undertaking for the year ending June 30 last. The accounts accompanying it show that the revenue in this period amounted to £2793; the expenditure, to £1817—leaving a balance of £976. The sum available for distribution is £1472; and the Directors will propose a dividend at the rate of 8½ per cent. per annum on the original capital, and of £5 19s. per cent. upon the additional capital. This will absorb £825, and leave £647 to go forward.

The affairs of the Kingston-upon-Thames Gas Company are in a very prosperous condition; for, according to the statement of the Chairman (Mr. Philip Jones) at the recent meeting of the shareholders, the half year ending June was the most successful the Company have ever experienced, in token of which the Directors have resolved to reduce the price of gas by 1d. per 1000 cubic feet as from July 1—making the present price 2s. 11d., which is lower than any rate in the district around. Further than this, they will make no charge in future for laying the service main into the houses of new customers. Hitherto they have laid the service from the main to the boundary of the property on which gas is to be introduced; the owner or tenant bearing the rest of the cost. Now the pipe will be taken right into a house and fixed up as far as the meter by the Company; thus effecting a substantial saving to consumers. The Deputy-Chairman (Mr. B. Marsh) stated that there are now 700 cooking-stoves out on hire. He also mentioned that the Directors had wished to drop the price to 2s. 10d.; but they had to keep in view the possibility of more trouble in the coal trade, which might mean a greater outlay than was now incurred. The report having been adopted, votes of thanks were passed to the Directors and chief officers. The Engineer (Mr. H. F. Packham), in the course of his reply, offered a few observations, chiefly upon the vast improvement effected by the invention of the incandescent gas-light, though he admitted that it was against the interests of the Company to push it, because of the saving effected in consumption. For all this, he strongly urged its introduction wherever practicable, and predicted that, as the working of the patent became further developed, the advantages of the method employed would be more recognized, and that gas need not fear competition with electric light as an illuminant.

The half-yearly accounts of the Milnrow Gas Company show a disposable balance of £621; and the Directors recommend the payment of a dividend of 8 per cent., free of income-tax. The sum of £1740 was received for gas; and the residual products realized £340. The balance of profit was £687. The reserve fund stands at £800.

The annual meeting of the Morecambe Gas Company was held last Friday, when the shareholders were informed that the past year had been one of considerable anxiety to the Directors. The coal strike (after deducting the increase in the selling price of coke) resulted in a net loss of nearly £400, in addition to which, in consequence of the depressed season at Morecambe, the consumption of gas had not been so large as in the preceding year. On the other hand, the amount realized from the sale of residuals had, during the past few months, almost recouped any loss arising from the above causes. The profit on the working of the year, after paying interest on preference stock and mortgages, amounted to £1851; making, with the balance of £257 brought forward, a sum of £2108 available for dividend. An interim dividend of 5 per cent. was paid in March; and with the further dividend of 5 per cent. declared on Friday, £2000 will be absorbed. The Directors also made the gratifying announcement that more favourable contracts have been entered into for the supply of coal; and they have resolved to reduce the price of gas supplied for private lighting by 3d. per 1000 cubic feet from the beginning of October. During the year a new gasholder was completed, at a total cost of £6100; and it is believed that this will afford sufficient storeage accommodation for a considerable time.

The amount divisible among the shareholders of the Normanton Gas Company as the result of the working of the past half year is £961, from which a dividend at the rate of 8 per cent. is to be paid, and £160 transferred to the reserve fund. The make of gas in the six months was 13,798,000 cubic feet; being an increase of 355,000 feet. The leakage was 12 per cent., arising largely from the breakages of mains by the settling of the roads.

At the half-yearly meeting of the shareholders in the Portsea Island Gas Company, which was held on the 25th ult., the chair was filled by Alderman Sir W. D. King, D.L., J.P., the Chairman (Alderman J. Baker, M.P., J.P.) being unavoidably absent. The accounts presented showed that the income for the half year ending June 30 was £51,456, of which £12,769 had been carried to the profit and loss account. The Directors recommended the payment of dividends at the rates of 13 per cent. per annum on the "A" and "B" shares, 12 per cent. per annum on the "C" shares, and 5 per cent. per annum on the stock, less income-tax. The Directors also recommended that the usual donation of coke, to the value of £60, should be distributed among the poor of the borough during the ensuing winter. The report was unanimously adopted; it being explained that the consumption of gas in the half year had increased by 7 per cent. as compared with the corresponding period of 1893.

Notwithstanding the general depression of trade, the Directors of the Sunderland Gas Company are able to report that the make of gas during the year ending June 30 last has increased by 3·93 per cent., principally arising from the extended use of gas for engine, cooking, and heating purposes. The total revenue for the twelve months has been £80,990, and the expenditure £61,158; showing a balance of £19,832. The profit of the past year has been augmented in consequence of the favourable contracts for coal over that period. The Directors have had, however, to renew the coal contracts at a substantial advance; but, as residuals are in active demand at fair prices, the future prospects of the Company are still of an encouraging character. Regarding the works, satisfactory progress is being made with the new retort-house and gasholder at Hendon, both of which will be completed and ready for work before the winter of 1895. In order to meet the payments to the contractors which may become due this year, notice has been given by the Directors of their intention to sell by auction 1000 £5 shares; being part of the additional capital authorized to be issued by the Company's Act of 1857, the maximum dividend on which is limited to 8½ per cent. An interim dividend was paid in March last; and the Directors now recommend a like dividend of 5 per cent. on the original stock and 4½ per cent. on the additional capital stock. Before closing their report, the Directors mention that, by the lamented deaths of Mr. E. C. Robson and Mr. J. S. Wilson, two vacancies in the Directorate were created, which have been filled up by the election of Mr. J. B. Simpson and Mr. T. C. M'Kenzie.

The report and accounts to be presented at the half-yearly general meeting of the Weymouth Consumers' Gas Company were noticed in the JOURNAL for the 14th ult. It now only remains to say that, in moving their adoption on that occasion, the Chairman (Mr. R. Thomas) referred to the difficulty the Company had experienced in consequence of the strike in the coal trade; and he expressed the obligation they were under to the coal merchants in the town for helping them out of their trouble, and enabling them to maintain the lighting of the place. The merchants knew very well that the Directors only applied to them in their extremity; and yet they cordially let them have all the supplies in their power. In spite of these adverse circumstances, the Directors were able to offer the shareholders the usual statutory dividend. Though the Company did not go forward by "leaps and bounds," the consumption was steadily increasing. They were now getting nearly to the end of their tether, and the shareholders should know it, as they would have to remodel their works, having almost outgrown their capabilities of supply. When they were bound to commence this, the alteration would be a large one; as the more effective the works were made, the cheaper and better it would be for the consumers. The Directors, however, hoped to tide over this undertaking for a short time longer, and not go to Parliament this year; but later on it would be almost an imperative necessity to apply for enlarged powers and increased capital. The Directors were managing the concern as carefully as possible; and there had been no increase in the capital for the last 13 years—not a single pound having been added. The motion was carried unanimously. In acknowledging a vote of thanks to the Directors, Mr. Robens remarked that, while they were pleased to know that the shareholders and the inhabitants were satisfied at the way in which the Company had discharged their obligations, the proprietors owed a deep debt of gratitude to their energetic Secretary and Manager (Mr. J. Lowe). If they were in a state of prosperity, he could assure them that it was largely owing to the management of the concern under his able supervision. Not only Mr. Lowe but everyone working under him did all they possibly could in the way of active and honourable service; and in proposing a vote of thanks to them, he was sure he was only doing that which would meet with cordial approbation. The motion was carried by acclamation. Mr. Lowe assured the proprietors that he was obliged for their kindly expression, which, he said, was not lost either on himself or on the other officials of the Company.

The shareholders of the Wolverhampton Gas Company met last Tuesday, under the chairmanship of Mr. H. W. Owen. The Directors' report for the half year showed that the net amount of profit was £8012; and it was recommended that the payment of dividends be at the rate of 3 per cent. on the preference stock, 5 per cent. on the consolidated stock, and 3 per cent. on the ordinary stock—the balance to be carried to the reserve fund. The Chairman, in moving the adoption of the report, remarked that the balance-sheet was much better than the Directors had anticipated it would be on account of the coal strike. They were anxious to effect a reduction in the price of gas, and hoped shortly they would be able to let the consumers have it at 2s. 6d. per 1000 cubic feet, instead of 2s. 7d. as at present. The coal contracts for the ensuing year were at slightly increased prices over last year; but they might be considered satisfactory. During the half year, contracts had been entered into for a new tank and gasholder,

and considerable progress had been made in their construction. The report having been adopted, and the dividends declared, a vote of thanks was passed to the Directors and officers. The Engineer (Mr. John Annan), in acknowledging the compliment, said that they had an enemy in the field in the electric light, which would soon be in active operation; but he did not consider it a very great rival. He had no doubt that, aided by the improvements which were being effected at the works, the Company would be able to hold their own.

Water Companies.

The receipts of the Lewes Water Company for the year ending June 24 last amounted to £3284; while the expenses came to £1213—leaving as profit £2071. The interim dividend paid in February last required £1035; so that, at last Tuesday's meeting, the shareholders had £1036 for disposal. Dividends of 5, 3½, and 2½ per cent. were declared on the various classes of capital for the past six months; making 10, 7, and 5 per cent. respectively for the year. The estimated quantity of water pumped in the twelvemonth was 113,205,000 gallons, giving an estimated daily average per head of 28 gallons.

The ordinary general meeting of the Maidstone Water Company was held on the 22nd ult., under the presidency of Alderman Charles Ellis, J.P. The report presented stated that the water-rents in the past half year amounted to £4562; and that the accounts showed a profit of £2055 available for dividend—making £5554 to the credit of the profit and loss account. A dividend of £4 12s. 6d. per cent., free of income-tax, on the 10 per cent. shares, and one of £3 5s. per cent. on the 7 per cent. ordinary shares, was declared for the half year; these payments being calculated to absorb £2075, and making the dividend on the 10 per cent. shares £9 9s. 2d. per cent., and on the 7 per cent. shares £6 12s. 6d. per cent. for the year. The Chairman said the concern was in a very satisfactory condition. The high quality of the water was maintained; the machinery was in good order; and the register showed the waste to be as limited as in any town in England.

The half-yearly meeting of the North-East Warwickshire Water Company was held last Tuesday. The Directors' report was to the effect that the number of houses connected with the mains showed an increase of 105 in the six months; that the revenue from water-rates had increased from £726 to £997; and that the deepening of the new well at Stockingford was being proceeded with. The Engineer's report stated that 1779 houses were now connected, and that the revenue from house property was £1542 per annum, and that from meter supplies £462. In moving the adoption of the report, the Chairman (Captain H. Townshend) intimated that he was anxious that the undertaking should belong to the town of Nuneaton. The report was adopted.

The revenue of the Sevenoaks Water Company for the last half year shows a falling off as compared with the corresponding period of 1893, arising partly from a reduction in special cases of the meter-rates, but mainly from a smaller quantity of water used by meter consumers. The balance at the credit of profit and loss is £1034 and out of this a dividend has been declared at the rate of 8 per cent.; per annum on the consolidated stock, and £5 12s. per cent. per annum on the share capital, free of income-tax. The payment of this will absorb £1018. With regard to the works, the Directors—having had for some time under consideration a scheme whereby the cost of pumping might be reduced, and at the same time provision be made for the future wants of a large and growing district—have decided to sink a new well, from which, when completed, beneficial results are anticipated.

At the meeting of the South Essex Water Company on the 25th ult., the Chairman (Mr. J. C. Amos), in moving the adoption of the report, stated that the net profit for the half year ending June 30 last amounted to £5321. This increased income was due to the reduction of interest and the reduced amount of working expenses. The concern was in a more satisfactory condition than it had been for a considerable time. Not many years ago, they had a difficulty in making both ends meet; but now they had a property which gave them a net profit of £10,000 a year. The second section of the reservoir at Aveley had been commenced, and was in a forward state; and the laying of a direct main from the Hog Hill reservoir to Ilford had been nearly completed, to meet the future requirements of that portion of the district. The result of the half-year's working enabled the Board to recommend a dividend of 5 per cent. upon the preference stock for the half year, 4½ per cent. upon the 1861 ordinary stock, and £2 19s. 6d. upon the 1882 ordinary stock; leaving £4311 to be carried forward. The motion was agreed to.

The half-yearly meeting of the South Hants Water Company was held last Friday week. It appeared from the report that the revenue continued to improve; the divisible profit for the six months being (approximately) £2632. The rent-roll had increased by the sum of £397. The Directors proposed an interim dividend for the past six months at the rates per annum of 5 per cent. on the old ordinary shares, and 3½ per cent. on the new ordinary shares. It was announced that the Bill promoted in Parliament by the Company this session for extending the limits of the supply, for providing additional capital, and for other purposes, received the Royal Assent on July 3. A contract, it was also stated, had been entered into for the construction of a new reservoir at Timsbury on a high level, to supply water by gravitation, and the work was now in progress. The report was adopted.

In submitting for adoption the half-yearly report and balance-sheet at the meeting of the South Staffordshire Water Company last Thursday (see *ante*, p. 340), the Chairman (Mr. Frank James) remarked that the progress of the concern was evinced on all sides of the accounts, whether they looked at them from the point of view of capital expenditure, or that of the increase of revenue. The number of houses to which supplies had been laid on during the half year was 1838, as against 1321 in the corresponding period of 1893. They reckoned a few years ago that the entire population of their parliamentary area was something like half a million. If they multiplied the number of houses they were now supplying by five, they found they were providing water for considerably over 400,000 people; many of the districts being served to the extent of about 90 per cent. of the houses. The water-rates had increased from £40,186 in the corresponding period of 1893 to £41,378 last half year. They had a balance of £19,196 to deal with; and the Directors proposed that a dividend at the rate of 5½ per cent. should be declared, which would enable them to carry forward £3345, as against £3084 last half year. The capital account showed a gross outlay of £11,905, after deducting £490 received as premiums on debenture stock during the six months. Very nearly £5000 had been paid in additional mains; something like 10¾ miles having recently been laid. He would like to call attention to the item for rates. In the course of the half year, £3391 had been paid under this head, as against £2768 in the preceding six months, and £3213 in the corresponding period of 1893. He looked forward with some little anxiety to the constant increase of rates. If they had been leaping up while local authorities had been receiving so much money in aid of the rates, he wanted to know what the result would be when district and parish councils came into operation. Would they not be heavier still? The motion was passed.

The half-yearly meeting of the West Surrey Water Company was held at the chief office, No. 38, Parliament Street, Westminster, last Thursday—Mr. A. Telford Simpson, M.Inst.C.E., in the chair. The Directors, in their report, stated that the income for the half year ending June 30 last amounted to £3244, and the expenditure (including £100 charged on account of law costs to £1465. A length of 672 yards of cast-iron pipes was laid for the extension of the service-mains, and 135 new supplies were connected—representing a future rental of about £210 per annum. The Engineer and Manager (Mr. J. K. Hill) reported that the Company's works and plant were in good order. In the action brought against the Chertsey Guardians, to restrain them from constructing works and supplying water for the purpose of flushing sewers, and so infringing the rights of the Company, judgment was given in favour of the defendants (see *ante*, p. 147). The Thames Conservancy deposited a Bill last November for increasing the annual payment for water drawn from the Thames. A petition was lodged by the Company against the Bill; and the proposed extra charge of £100 per annum was withdrawn. The amount available for division was £1889, which the Directors recommended should be applied in the payment of dividends at the rates per annum of 5 and 6 per cent. upon the preference shares, amounting to £536; and to the payment of a dividend at the rate of 4½ per cent. per annum upon the ordinary shares, amounting to £1046—leaving a balance of £307 to be carried forward. The report was adopted; and the dividends recommended were declared. A vote of thanks was accorded to the Chairman and Directors, as well as to the Secretary (Mr. H. G. Thompson, Assoc.M.Inst.C.E.) and officers of the Company.

The half-yearly meeting of the Woking Water Company was held last Tuesday, at the offices, 5 and 6, Great Winchester Street, E.C. The report—which was noticed in our issue for the 21st ult.—was submitted for adoption by the Chairman (Mr. C. Horsley). In the course of his remarks, he stated that there had been an increase in the expenditure on capital account; the total now being £82,825. The revenue for the six months amounted to £2940; and the expenses, to £1360. These figures indicated a satisfactory progress in the business of the Company. As to the increased expenditure of capital, it would be remembered that the Directors informed the shareholders at a previous meeting that they were about to lay out further money in providing new engines and a main. The balance of revenue carried to the profit and loss account was £1580; and the amount available for dividend was £1498. Out of this sum, the Directors recommended the payment of an interim dividend of 4 per cent., free of income-tax, which would absorb £1359, and leave £139 to be carried forward. The Engineers (Messrs. J. Quick and Son) reported that the works were in good order; but, of course, to keep them so, a certain amount of expenditure was required. The new engines which they had put in at the West Horsley station were now at work; and the 9-inch main connecting Horsley with the Clandon station was also completed. He did not think they would have any more complaints as to shortness of water. The springs were very good and strong just now; and the Directors did not anticipate trouble in any way whatever for some years. Notwithstanding this, they intended to continue producing more water, if possible, by driving adits, so as to be prepared for any increased demands; and he might say that they were increasing very rapidly now. As to the proposed dividend at the rate of 4 per cent. per annum, he thought that for these times this was a fair return on an investment, though it was not so good as the Board hoped to attain to. In seconding the motion, Mr. R. Hesketh Jones mentioned that the Directors a few weeks since visited the Company's works and found them in a satisfactory condition. The motion was carried after a brief conversational discussion.

New Water-Works for Lucknow.—Water-works for the supply of Lucknow have lately been completed by Messrs. Martin and Co. According to the *Lucknow Englishman*, they are to supply 2 million gallons of filtered water, pumped from the River Goomti, for a population of 200,000, at an estimated requirement of 10 gallons per head per day. The total cost, in round figures, has been 15 lakhs of rupees. The cantonments of Lucknow have taken advantage of the municipal undertaking, and have added no less than 23 miles of pipes, through which water is distributed all over their district. The total cost of both projects has been upwards of 30 lakhs of rupees. The works were completed in the short period of 18 months.

Extensions at the Stockton and Middlesbrough Water-Works.—At the last meeting of the Stockton and Middlesbrough Water Board, the Chairman (Alderman Bulmer) submitted for adoption a proposal, suggested by the Engineer, by which it would be possible to draw off 14 or 15 feet of the top water of the Blackton reservoir to supplement the supply at Hury. He stated that the Blackton reservoir was originally intended for compensating the river only; but if the present project were carried out, they would be able to take water for supply purposes if the quantity in Hury fell short. In reply to a question, the members were informed that an extra supply of 200 million gallons of water would be available under the proposed scheme, which was to substitute another, at about half the cost. The motion was agreed to.

THE NEW WATER-WORKS FOR MORLEY.

The formal opening of the new water-works for the borough of Morley, last Saturday week, was the occasion of great public rejoicing; and the ceremony of turning on the valve passing the new supply was witnessed, in the Queen's Park, by a large concourse of people. The Town Clerk (Mr. R. B. Hopkins) made a statement regarding the new works. He said that they had been constructed under powers conferred upon the Corporation by the Morley Water Act, 1890. The scheme comprised the Withens Clough storeage reservoir, situated about 3¼ miles from Mytholmroyd; two catch-water conduits, and an iron pipe aqueduct, through which the water was conveyed from the reservoir to Morley. The supplies of water were obtained from gathering-grounds 1200 acres in extent; and the sources were very favourable to an ample and reliable supply of water, and the delivery of the water at a level sufficiently high for all requirements. The minimum dry weather quantity was about 250,000 gallons per day; the maximum during the wet seasons being very considerable. Compensation water was sent down the streams from the reservoir at the rate of 580,000 gallons per day. The water collected and impounded in the reservoir was soft and pure, and of special value for trade uses, as well as for domestic supply. The storeage reservoir and works occupied an area of 80 acres; the water area of the reservoir when full being 65 acres. The capacity of the reservoir was 330 million gallons; and the depth of water above the drawing-off culvert was 60 feet. The greatest depth of water in the reservoir was 72 feet; and the centre height of the embankment above the stream level was 85 feet. The overflow level of the reservoir was 960 feet above Ordnance datum; and the level at which the water was drawn off for supply was 900 feet. The aqueduct which conveyed the water from Withens Clough to Morley was 21 miles in length, and consisted of a line of 15-inch iron pipes throughout. The sources of supply were selected, and the works designed, by Mr. Charles Gott, C.E., of Bradford. The ceremony of turning on water was performed by the Mayor (Mr. S. Stockdale). Presentations were then made by the Engineer and Contractors to the Mayor and Alderman Schofield, the Chairman of the Water Committee; these consisting of two splendid massive silver punch bowls, mounted on ebony plinths. Sports of various kinds were subsequently held; and in the evening the Mayor and Corporation, with a few guests, dined together.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

A fuller statement of the Aberdeen Corporation gas accounts has now been published. From this it appears that gas and meter rents realized, during the ten months dealt with, £59,606; residual products, £9455; and gas-stoves, £234. The amount paid for coal was £29,039, so that residuals brought a return of nearly one-third of the cost of coal. There is a balance of profit on the account of £7670. The quantity of coal carbonized was 35,443 tons, the average price of which was 16s. 4¾d. per ton; and the yield of gas was 360,338,000 cubic feet, which is at the rate of 10,166 cubic feet per ton. It is satisfactory to note that the unaccounted-for gas has been reduced from 10·05 to 7·64 per cent. The favourable state of matters enables the Council to reduce the price of gas; and on Thursday the Gas Committee met and resolved that the reduction would be from 3s. 8d. to 3s. 5d. per 1000 cubic feet, which is the lowest price at which gas has ever been sold in Aberdeen.

The filling up of the vacant post of Gas Manager at Forfar is apparently a heavier task than the members of the Corporation calculated upon. They have received 46 applications. On Monday night, when they met to consider them, the unthinking element in the Council imposed upon the rest the task of sitting to hear all the applications and accompanying testimonials read in public. The Clerk had before then intimated that he had divided the applications into two classes; the one containing gas managers and assistants, and the other "fish curers and managing capacity men." The latter class surely might have been lopped off; but the Council thought otherwise, and the reading of the documents was started. The first occupied six minutes; and when attention was called to the waste of time involved, the procedure was quickened, so that, at the end of two hours, a short leet of ten was selected. This list is to be further reduced; but the work is to be done by the Council, and not by a Committee. So much precaution should result in the best man being selected; but it adds greatly to the amount of work. It is to be observed that no local name appears on the short leet.

A very gratifying incident is reported from Perth. The Assistant Manager (Mr. J. Easson) is one of the candidates for the vacancy in Forfar, and is on the short leet. His salary in Perth is £104. As soon as it was realized that there was a probability of his services being lost to the city, the Gas Commissioners met and resolved to advance his salary to £150. This must be a pleasing tribute to Mr. Easson, who, though it may be tardily, has had his capacity acknowledged in the most practical form possible.

A system of regenerative firing for the retorts has been introduced into the Broughty Ferry Corporation Gas-Works; and the new plant is reported to be working satisfactorily. The yield of gas by it is at the rate of 10,970 cubic feet per ton of coal carbonized, which is about 1000 cubic feet per ton more than was obtained by the old plant.

You had an article last week upon the drafting of Acts of Parliament, concerning which subject I have before me a most forcible example of the weakness which often creeps into statutes through inadvertence in drafting. The Scottish Local Government Act, when introduced into Parliament, contained provisions empowering local authorities to create lighting districts; but no power was given to them to manufacture or supply illuminants. When the Bill was passing through the Grand Committee of the House of Commons which sat upon it, the omission was observed, and the attention of Mr. Jacks, the representative of Stirlingshire (in whose county there is at present the question of the lighting of rural areas expected to be up for consideration, in connection with the transfer of the Falkirk Joint Stock Gas Company's undertaking to the Corporation of Falkirk) was called to it. There are several populous places in the neighbourhood of Falkirk which might be lighted from the town works; and in the Act which has been secured by the Corporation for the transfer, the County Council have obtained a clause protecting them. This, however, would have been of no avail had the Local Government Act passed as it was drafted. Mr. Jacks found it impossible, owing to the rush with which the measure was run through the Grand Committee, to get it amended; but when it went to the House of Lords, Lord Balfour of Burleigh interested himself in the matter, and the Government undertook, when the Bill returned to the House of Commons, to insert the necessary clause.

The Corporation of Edinburgh this week agreed to the recommendations of their Lighting Committee, with reference to the lighting of common-stairs. These are that in cases where the residents in those stairs desire it, the Corporation will undertake to extinguish the lights at sunrise; the residents being bound to pay them beforehand for the gas to be consumed and for the services of the extinguishing staff. The inhabitants will still have the duty upon them of lighting the lamps; the surmise being that, though they cannot be trusted to extinguish at the proper time, self-interest may be relied upon to provide for the lighting. On account of the great saving which there will be in the gas consumed, the Gas Commissioners are able to supply it at a much lower figure than when dealing with the residents; and thus the cost of gas and of extinguishing will not differ greatly from the charge which has hitherto been made for gas alone. The arrangement is to be a voluntary one, the reason for which no doubt is that common-stairs are private property, and so the magistrates could not pass an order requiring it to be adopted. But they have done their best to make it popular by fixing the charge at about 2s. a year less than it will be if occupiers deal with the Gas Commissioners direct. The arrangement is to be for a year, as an experiment.

Another subject upon which the yearly experiment was urged on the Council, but with no success, was in connection with a proposal to light a number of central streets by electricity. The thoroughfares were George Street, St. Andrew Square, Charlotte Square, and cross streets on the south side. Now with regard to these, it has to be observed that they are business thoroughfares of a high class, comprising within them nearly all the principal offices of the banks and insurance companies, and much highly-rated property besides. After the scheme of the Town Council for the electric lighting of public streets was published, and it was found that these thoroughfares had been left out, there arose an agitation for their inclusion. For a time, the Lighting Committee were obdurate; but at last they were talked over, and the result was a recommendation by them that these thoroughfares should be lighted. The plea put forward was that the property was so valuable. It was a poor plea, as Lord Provost Sir James Russell pointed out when he said that hitherto they had followed the policy of lighting people, but now it was proposed to light property, which would be a novel principle. It was urged in support of the Committee's recommendation, that it would only cost £514 extra to light these thoroughfares. Mr. A. D. Mackenzie, who is the Convener of the Electric Lighting Committee of the Council, and is an enthusiast in his work, spoke both sensibly and otherwise. In passing he had a "fling" at the gas lighting of Edinburgh, which has become fashionable (and regarding which I may have something to say when I have time to look into the matter), and said that if they did not extend the electric light to these streets, they must increase the gas light. He thought the introduction of the electric light would cause a demand for more gas light, which is a truism; but then he went on to say that he did not believe there would be a deficit upon electric lighting. I am dealing with public lighting, and do not propose to enter into calculations regarding balance-sheets of the future. But upon public lighting, if Mr. Mackenzie does not believe that the balance-sheet for lighting thoroughfares by electricity will show a loss as compared with gas lighting, the example of Dundee must be a very misleading one. Deficit, strictly speaking, there cannot be, because the cost of public lighting is charged upon the city as a whole; but if districts were adopted, and the revenue and outlay upon them were recorded, there would be a deficit indeed. I do not think the citizens of Edinburgh realize that electric lighting will cost them about £50 per lamp per annum; or if they did, I am persuaded they would not go in for so extensive a scheme. I would not like to be Mr. Mackenzie a year after the installation is started, keeping in mind this statement of his. Happily, the Town Council took a right view of the matter, and rejected the recommendation of the Committee.

In connection with this subject, I may mention that on Thursday a writer in the *Scotsman*, upholding the decision of the Council, quoted largely from the JOURNAL, both from the review of M. Maréchal's work and the leading article. This should have an excellent effect in enlightening the citizens upon the subject of street lighting, and can only be productive of good.

The Glasgow Gas and Electricity Committee have resolved to continue the price of gas at 2s. 6d. per 1000 cubic feet, and of electricity at 6d. per unit. The latter was, until some time ago, 7d. I have not yet received a copy of the accounts for the year (their publication having been delayed because the coal contracts could not be fixed until the coal strike was over); and so I am unable to state with any authority how the department stands compared with former years.

For some time there has been the feeling in the Rothesay Corporation that their position would be improved if they put down plant for the recovery of residual products. There was, however, this barrier in the way to begin with, that there was no room in the existing works for such plant. Attention was then turned to the question of whether the works should not be removed to a new site. A probable site was looked at; and a price which the Commissioners considered within reason was quoted for it. But in order to strengthen their position, the Committee who were investigating the matter called in Mr. T. Wilson, of Coatbridge, to advise them. Mr. Wilson's report was to the effect that the cost of removal would be from £15,000 to £16,000. In view of the largeness of the sum, and also that the subject had not been before the ratepayers, it has been resolved to delay consideration of the subject further; the Gas and Finance Committee being asked to bring up in the meantime a report upon it.

The Scotch coal strike is nearing the end of its tenth week; and there is every appearance that it is nearing its own end. This week the miners balloted upon the question of whether they should stand out for the shilling for which they struck, or should adopt the Federation recommendation of accepting 6d. They have, by 25,417 to 20,942 votes, or a majority of 4475, resolved to accept the Federation proposals. It is to be observed, however, that the Federation terms have never been offered to them; and, in fact, the masters have, since the result was announced, declared that they will offer nothing. They are more determined than ever to hold out. The men are, on the contrary, divided. Their leaders are endeavouring to let themselves down gently; by finding excuses for the strike having been ever originated. Meanwhile large numbers of men are returning to work; and I anticipate that another week will see a general resumption of work.

The balance-sheet of the Greenock Water Trust for the past year showed a revenue of £26,231, and an expenditure of £25,894; leaving a surplus of £337. This result was attained notwithstanding that a year ago the domestic water-rate was reduced from 9d. to 6d. per pound. In moving the adoption of the report, Provost Shankland said householders had, by the reduction, been relieved to the extent of £1844, public works to the extent of £21, and the public rate to the extent of £758. The domestic rate was continued at 6d. per pound.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Sept.* 1.

Sulphate of Ammonia.—There is really no change either for better or for worse. The production is still small, so is the demand; and although buyers generally are on the *qui vive*, the inclination to operate is within a narrow compass. At present reduced quotations (about £13 10s.), there is probably more inducement to secure supplies; and this view is corroborated by the figures paid for forward delivery in Scotland—viz., £13 7s. 6d. to £13 10s. for October/March delivery; but it will perhaps be a little while before buyers will definitely make up their minds, because they still cherish the hope of a further decline in values. Nitrate meanwhile keeps very steady.

LONDON, *Sept.* 1.

Tar Products.—The better feeling in benzol has been further accentuated this week; and it is probable that the forward value of both 50's and 90's will improve. Solvent naphtha is in excellent request. Makers' stocks of both benzol and solvent are now low, and the production is at its minimum; and it is hoped that the improved prices now realized will not suffer relapse as the increased make comes on. Pitch continues firm; and buyers are now bidding for next year's delivery. Naphthalene is difficult to sell; and it is as great a nuisance to the tar distiller as it is to the gas maker. Were it not that large quantities are burnt as fuel, this product would be absolutely unsaleable. Carbolic acid is moving off freely; but the price does not improve. Anthracene is held strongly; but no new business is reported. Prices: Tar, 15s. to 19s. Pitch, 34s. spot; 32s. forward. Benzols, 90's, 1s. 1d.; 50's, 1s. 1d. Solvent naphtha, 1s. 4d. Toluol, 1s. 5d. Creosote liquid, 2½d.; ordinary, 1½d. Creosote salts, 15s. Cresylic acid, 10½d. Crude benzol naphtha, 30 per cent., 5d. Carbolic acid, 1s. 7d. Anthracene, "A," 1s. 1d.; "B," 10d.

Sulphate of Ammonia is now again more in request; and large business is being done at prices ranging from £13 10s. to £13 12s. 6d., less 3½ per cent. Stocks are low. Nitrate of soda is strong at quoted prices, which are above that of the parity nitrogen value of sulphate, which will prevent sulphate from seeing lower prices at present. Gas liquor is offered at 10s. to 11s. 6d. per ton.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—Business all through continues to drag on from hand to mouth, with no really quotable change in prices, which seem now generally to have got to the minimum that they are likely to touch during the remainder of the summer season. With the commencement of the month, there has been no further change in the list rates of the leading Manchester colliery concerns, which during the past month had to give way on a great many classes of round coal and engine fuel to the extent of fully 5d. per ton, to meet competition from outside quarters. The Lancashire Coal Sales Association, at their district and Council meetings, have also decided that no change shall be made in the current list rates. In the open market, there is yet some very low cutting to get rid of surplus stocks. Although the strike of miners in Scotland is still taking away a good deal of the output which would otherwise be thrown upon the market, there seem to be anticipations that some settlement of the dispute in the above district will shortly be arrived at; and this has tended rather to check the weight of buying during the last few days. Local and inland requirements for all descriptions of round coal, and also for engine fuel, continue extremely slow; and in the manufacturing classes of fuel, requirements have been considerably restricted owing to the protracted holiday stoppages in many of the Lancashire districts. At the pit mouth, best Wigan Arley averages 11s.; Pemberton four-feet and seconds Arley, 10s.; common house coals, 8s.; and steam and forge coals, 7s. per ton. Although in some cases 6d. above these figures is quoted, it is exceptional where it is being actually obtained. For engine classes of fuel, prices range from 3s. 9d. to 4s. 3d. for the commoner classes of slack, and 4s. 9d. to 5s. 3d. for good medium sorts, up to 6s. for some of the best descriptions, at the pit mouth. There is still a fair amount of business doing in the shipping trade, with prices remaining at about 8s. 9d. to 9s. for steam coal, and 5s. 6d. to 5s. 9d. for engine fuel, delivered at the Garston Docks and the High Level, Liverpool.

Northern Coal Trade.—There has been a very large demand for coal, sufficient even at this time of the year to give full employment to the Northumbrian collieries, and to increase the time usually worked by the Durham pits at this season. Of course, the addition is mainly due to the demand from Scotland, to which part considerable quantities of both locomotive and manufacturing coal are being sent, as well as gas and household coal. Best Northumbrian steam coals are in large demand, at from 10s. 9d. to 11s.; second-class steam coals are quoted about 10s.; and steam smalls, at 4s. 9d. to 5s. per ton f.o.b. The pits are fully employed, and are booking forward orders that will give employment well on to winter. In regard to Durham coals, the position is also better; for every week increases the normal demand, and there are still many cargoes being sent to Scotland. Gas coals are rather firmer. Best Durham gas coals are quoted at 7s. 3d. to 7s. 6d. per ton; and some further local contracts are being settled at about the equivalent of the f.o.b. price. Much larger quantities of gas coals are now being sent out early, so that it would seem that consumers are stocking more freely just now. Manufacturing coals are, as a general rule, steady. Coke is rather easier; some of the furnaces in the north-west having been put out, so that consumption is less. The price of best Durham quality is now 13s. to 14s. per ton. Except that the demand is slightly increased, there is no alteration in the condition or price of gas coke this week.

Scotch Coal Trade.—This week, trade has undergone little change. Scotch coal is so scarce that, except in cases where there are contracts, it commands almost any price. For gas-works, there is still a supply held at the pits, which serves daily needs; and very few undertakings are in any way in straits. For those who may be, there is an abundant supply of English coal at 14s. per ton, delivered in Glasgow, which will prevent anything of the nature of collapse in gas lighting. This price for English coal is slightly down from last week, which is owing to the large supplies coming forward. The supply from England, in fact, may be said to exceed the demand. Scotch gas coal which is required to be purchased at present is quoted at 15s. 6d. per ton in Glasgow; but the demand for it is very small. Shipments for the week are down, amounting to 6330 tons—a decrease as compared with the preceding week of 1323 tons, and of 162,431 tons as compared with the corresponding week of last year. For the year to date, the total shipments have been 3,739,565 tons—a decrease upon the quantity in the same period of last year of 830,042 tons.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For Stock Market Intelligence, see ante, p. 462.)

Issue.	Share	When ex-Dividend.	Dividend or Div. Bonus.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon investment.
£			p. c.	GAS COMPANIES.				£ s. d.
590,000	10	12 Apl.	10½	Alliance & Dublin 10 p. c.	10	18½—19½	..	5 7 8
100,000	10	,,	7½	Do. 7 p. c.	10	13—14	..	5 7 2
300,000	100	2 July	5	Australian (Sydney) 5 % Deb.	100	105—107	..	4 13 4
100,000	20	14 June	8	Bahia, Limited	20	9½—10½	..	4 3 10
200,000	5	11 May	6½	Bombay, Limited	5	6—6½	+⅛	5 0 0
40,000	5	,,	6½	Do. New	4	4½—5	+⅛	5 4 0
380,000	Stck.	15 Aug.	11¼	Brentford Consolidated	100	222—227	..	5 1 4
180,000	,,	,,	8½	Do. New	100	172—177	..	4 16 1
220,000	Stck.	15 Mar.	11†	Brighton & Hove Original	100	210—215	..	5 2 4
888,500	Stck.	30 Aug.	5	Bristol	100	112–115*	+1½	4 6 11
320,000	20	29 Mar.	11¼	British	20	47⅛—48⅜	..	4 12 9
50,000	10	30 Aug.	11½	Bromley, Ordinary 10 p. c.	10	21—22*	+½	5 4 7
51,510	10	,,	8½	Do. 7 p. c.	10	16—17*	+½	5 0 0
328,750	10	28 June	2	Buenos Ayres (New) Limited	10	5⅞—6⅛	+¼	3 4 0
200,000	100	2 July	6	Do. 6 p. c. Deb.	100	99—101	..	5 18 10
150,000	20	12 July	8	Cagliari, Limited	20	25⅛—26⅛	..	6 0 8
550,000	Stck.	12 Apl.	12½	Commercial, Old Stock	100	263—270	..	4 12 7
165,000	,,	,,	9½	Do. New do.	100	195—200	..	4 15 0
160,762	,,	14 June	4½	Do. 4½ p. c. Deb. do.	100	132—137	..	3 5 8
800,000	Stck	14 June	13	Continental Union Limited	100	239—244	..	5 6 7
200,000	,,	,,	10	Do. 7 p. c. Pref	100	210—215	..	4 13 0
533,000	Stck.	30 Aug.	5	Crystal Palace Ord. 5 p.c. Stk.	100	105–110*	+½	4 10 11
486,090	10	27 July	11	European, Limited	10	22⅛—23½	..	4 13 7
354,060	10	,,	11	Do. Partly paid	7½	16—17	..	4 17 1
5,646,590	Stck.	15 Aug.	12	Gaslight & Coke, A, Ordinary	100	243—248	−2	4 16 9
100,000	,,	,,	4	Do. B, 4 p. c. max.	100	100—104	..	3 16 11
665,000	,,	,,	10	Do. C, D, & E, 10 p.c. Pf.	100	271—276	..	3 12 6
30,000	,,	,,	5	Do. F, 5 p. c. Prf.	100	130—135	..	3 14 1
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	100	195—200	+3	3 15 0
1,300,000	,,	,,	7	Do. H, 7 p. c. max	100	179—184	..	3 16 1
† 63,000	,,	,,	10	Do. I, 10 p. c. Prf.	100	270—275	..	3 12 9
476,000	,,	,,	6	Do. K, 6 p. c. Prf.	100	163—170	..	3 10 7
1,061,150	,,	14 June	4	Do. 4 p. c. Deb. Stk.	100	127—130	..	3 1 6
294,850	,,	,,	4½	Do. 4½ p. c. do.	100	132—137	..	3 5 8
908,000	,,	,,	6	Do. 6 p. c. do	100	175—180	..	4 6 8
3,800,000	Stck.	11 May	12	Imperial Continental	100	227—232	+2	5 3 5
75,000	5	14 June	6	Malta & Mediterranean, Ltd.	5	4⅞—5⅛	..	5 14 3
560,000	100	2 Apl.	5	Met. of Melbourne, 5 p. c. Deb.	100	109—111	..	4 10 1
541,920	20	14 June	5	Monte Video, Limited	20	14⅜—15⅝	..	6 9 0
150,000	5	30 May	8	Oriental, Limited	5	6¾—7⅛	+⅛	5 10 4
60,000	5	29 Mar.	7	Ottoman, Limited	5	4—4⅛	+⅛	7 15 6
166,870	10	31 Jan.	2	Pará Limited	10	1⅞—1¾	..	11 8 6
420,000	100	2 May	6	People's Gas of Chicago— 1st Mtg. Bds.	100	102—107	..	5 12 1
500,000	100	1 June	6	2nd Do.	100	95—100	..	6 0 0
150,000	10	26 Apl.	6	San Paulo, Limited	10	9—10	..	6 0 0
500,000	Stck.	30 Aug.	15½	South Metropolitan, A Stock	100	320–325*	+2½	4 15 3
1,350,000	,,	,,	12	Do. B do.	100	272–277*	+1	4 6 8
260,000	,,	,,	13	Do. C do.	100	284–289*	+1½	4 9 11
750,000	,,	12 July	5	Do. 5 p. c. Deb. Stk.	100	156—161	+1	3 2 2
60,000	Stck.	30 Aug.	11½	Tottenham & Edm'nton, "A"	100	215–220*	+5	5 4 7
				WATER COMPANIES.				
746,011	Stck.	28 June	10	Chelsea, Ordinary	100	285—290	..	3 9 0
1,720,252	Stck.	12 Apl.	8	East London, Ordinary	100	229—234	+1	3 8 5
544,440	,,	28 June	4½	Do. 4½ p. c. Deb. Stk.	100	147—152	..	2 19 2
700,000	50	14 June	8½	Grand Junction	50	119—123	..	3 9 1
708,000	Stck.	15 Aug.	12	Kent	100	300—305	..	3 18 8
1,043,800	100	28 June	9½	Lambeth, 10 p. c. max.	100	260—265	+2	3 11 8
406,200	100	,,	7½	Do. 7½ p. c. max.	100	207—210	..	3 11 5
330,000	Stck.	29 Mar.	4	Do. 4 p. c. Deb. Stk.	100	132—135	..	2 19 3
500,000	100	15 Aug.	12½	New River, New Shares	100	380—385	+1	3 3 0
1,000,000	Stck.	27 July	4	Do. 4 p. c. Deb. Stk	100	134—137	..	2 18 4
902,300	Stck.	14 June	6	S'thwk & V'xhall, 10 p. c. max.	100	168—173	..	3 9 4
126,500	100	,,	6	Do. D 7½ p. c. do.	100	149—152	..	3 19 0
1,155,066	Stck.	14 June	10	West Middlesex	100	273—278	..	3 12 0

*Ex div.

† Next dividend will be at this rate.

The Transfer of the Kendal Gas and Water Works to the Corporation.—A special meeting of the Kendal Corporation was held on the 20th ult., to authorize the payment of the purchase-money for the undertakings of the Kendal Union Gas and Water Company, and to pass the necessary resolutions and make orders in reference to the completion of the transfer of the business. The purchase-money is £80,000, with some small payments in addition, for which cheques were drawn, and the seal of the Corporation was affixed to the deed of transfer.

A Combined Electric Lighting and Drainage Scheme for Monmouth.—The Monmouth Corporation at their last meeting adopted a combined scheme of electric lighting and drainage, which has been drawn up by Messrs. Bramwell and Harris. The first outlay is estimated at £17,600; but deducting the present cost of gas for public lamps, and adding the earnings of 2500 8-candle power incandescent lamps (or their equivalent) provided for in the scheme for lighting public places and for private use, the work can be carried out at a cost of 7d. in the pound.

The Gloucester Corporation Newent Water Scheme.—The Gloucester City Council last Tuesday agreed to accept a tender submitted by Messrs. E. Timmins and Sons, Limited, of Runcorn—amounting to £7343 10s.—for carrying out the following work connected with the new water scheme: Excavating well to depth of 150 feet, and lining it to a depth of 60 feet, including provision of two pumping installations, if required, pumping during the execution of the work, and testing the yield of the well, £3543 10s.; (2) Driving two headings of 200 yards each, including pumping, £3800. The Corporation are not to be bound to sink the well to the full depth specified; and the contract provides that the Corporation shall have power to determine the contract without making the tunnels or driftways referred to in the second part, and to obtain fresh tenders for the work if they should think it expedient.

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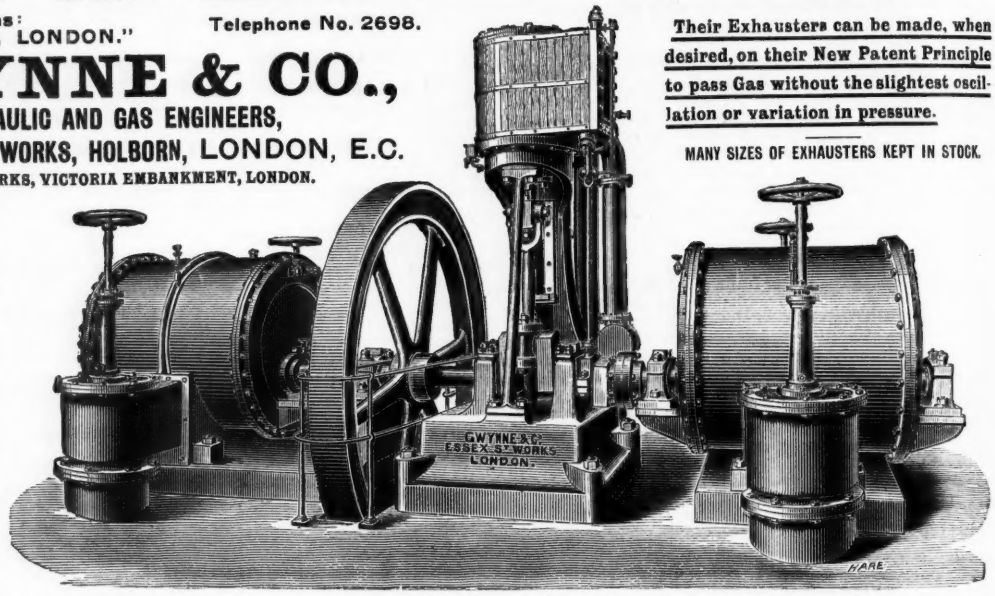
Late ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON.

They have completed Exhausters to the extant of 32,000,000 cubic feet passed per hour, which are giving unqualified satisfaction in work.

Makers of GAS-VALVES, HYDRAULIC REGULATORS, VACUUM GOVERNORS, PATENT RETORT-LIDS, STEAM, PUMPS for Tar, Liquor, or Water; CENTRIFUGALS, PUMPS and PUMPING ENGINES, specially adapted for Water-Works, raising Sewage, &c.

Also GIRARD and other TURBINES, HIGH SPEED ENGINES, DYNAMOS, &c., &c., for ELECTRIC LIGHTING.



Their Exhausters can be made, when desired, on their New Patent Principle to pass Gas without the slightest oscillation or variation in pressure.

MANY SIZES OF EXHAUSTERS KEPT IN STOCK.

Exhausting Machinery at Fulham and Bromley Gas-Works, London—each set passing 400,000 cub. ft. per hour drawing 14 miles distant from Beckton.
Catalogues and Testimonials sent on application.

NOTICE TO ADVERTISERS.—COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office *not later* than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of PERMANENT ADVERTISEMENTS should be received not later than the FIRST POST on SATURDAY.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale in the United Kingdom than all other Oxides combined. Purity and uniformity of quality guaranteed. Pamphlet, "How to Purchase Bog Ore," to be obtained on application.
Gas Purification and Chemical Company, Limited, Palmerston Buildings, Old Broad Street, London, E.C.
JOHN WM. O'NEILL, Managing Director.

GAS PURIFICATION AND CHEMICAL COMPANY, LIMITED.

ANDREW STEPHENSON, Agent. All communications *re* OXIDE to be addressed to PALMERSTON BUILDINGS, E.C.

WINKELMANN'S "VOLCANIC" CEMENT. Fire Resistance up to 4500° Fahr. In use in most Continental Gas-Works, and in more than 200 British Gas-Works. [See Advt., p. 355.]
ANDREW STEPHENSON, 182, Gresham House, Old Broad Street, LONDON, E.C. Telegrams: "Volcanism, London."

AMMONIACAL LIQUOR Wanted.
BROTHERTON AND CO., Ammonia Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

GAS TAR Wanted.
BROTHERTON AND CO., Tar Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

SPENT OXIDE Wanted.
BROTHERTON AND CO., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

BROTHERTON & CO.
Offices: Commercial Buildings, LEEDS. Correspondence invited.

JAMES LAWRIE & Co. supply Best SCOTCH CANNEL COALS, Best FIRE-CLAY RETORTS, BRICKS, TILES, and LUMPS; BOILER SEATING BLOCKS, FLUE COVERS, and SILICA BRICKS for SPECIAL FURNACE WORK; COKE BARROWS, BOGIES, and SMALL WAGONS.
Postal Address: 1, WHITTINGTON AVENUE, E.C.
Telegram Address: "EIRWAL LONDON."

W. C. HOLMES & CO., Huddersfield; AND 80, CANNON STREET, LONDON, Contractors for Gas-Works complete, Makers of Gasholders, Purifiers, Scrubbers, Condensers, Retort Fittings, &c., Improved Valves, Engines, and Exhausters. Also for Collingwood's Regenerative Retort-Settings.
*** See Advertisement p. 493, of this week's issue.
Cablegrams: "Ignitor London." Telegrams: "Holmes Huddersfield."

J. & J. BRADDOCK, Globe Meter Works, Oldham.
First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.
Telegraphic Address: "Braddock Oldham."

SPECIAL PAINT FOR GAS-WORKS.
JOHN E. WILLIAMS AND CO.,
VICTORIA PAINT WORKS, MANCHESTER.
Telegrams: "ENAMEL." National Telephone 1759.
GAS PLANT CEMENT
FOR ALL LEAKAGES.

SULPHURIC ACID.
JOHN NICHOLSON & SONS, Chemical Works, Leeds, specially produce this ACID from BRIMSTONE, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

GAS PURIFICATION.

OXIDE OF IRON BOG ORE.
BALE & CO.'S Oxide of uniform quality
Sample and Price on application.
OXIDE PAINTS, OILS, SULPHURIC ACID, &c.
120 and 121, NEWGATE STREET, LONDON, E.C.
Telegrams: "BOGORE, LONDON."

OXIDE OF IRON.

FINEST Quality of Natural Bog Ore.
Particulars and price, apply to Mr. T. L. ARCHER, 20, Fennel Street, MANCHESTER.

PORTER & CO., Gowts Bridge Works, LINCOLN, Engineers, Ironfounders, and Contractors for the erection of Gas-Works for, Towns, Villages, Mansions, Manufactories, Collieries, and Isolated Buildings, at home and adroad. Manufacturers of Retorts and Fittings, Condensers, Scrubbers, Purifiers, Valves, &c.; also of Girders, Wrought and Cast Iron Tanks, Iron Roofs, &c.
Telegraphic Address: "PORTER LINCOLN."

PATENTS FOR INVENTIONS.

J. C. CHAPMAN, M.I.M.E. and Fel. Chartered Inst. Patent Agents. ADVICE ON ALL MATTERS CONNECTED WITH ABOVE.
Information and Handbook on application.
70, CHANCERY LANE, LONDON, W.C.

REDHILL GAS-WORKS ASSESSMENT APPEAL

THE Report of the proceedings at the hearing of the APPEAL of the REDHILL GAS COMPANY against the RATING OF THEIR PROPERTY in Reigate and Nutfield which was published in the JOURNAL has been reprinted (by desire) in Pamphlet form; and copies can be obtained, on application to the PUBLISHER, *price 4d. each.*

ALWAYS a Buyer of Spent Oxide, Tar, and AMMONIACAL LIQUOR.
Apply to J. HARDMAN, Milton, STAFFORDSHIRE.

NOTICE OF ACCIDENTS ACT, 1894.

A CARD suitable for Exhibiting in Gas-Works, directing Officers and Workmen to REPORT to the Manager or Deputy-Manager all ACCIDENTS witnessed by them, together with the Clause of the Act specifying the notice required to be sent to the Board of Trade, has been prepared in compliance with a suggestion; and copies can be obtained, on application to the PUBLISHER of the JOURNAL, *price 4d. each, or 2s. 6d. per dozen, post free.*

WANTED, a Situation as Gas-Fitter.
Has a knowledge of Meter Repairing, Testing, &c. Used to Small Works.
Address A. E. S., 2, Queen Villa, Oldfield Park, BATH.

WANTED, a Situation as Gas-Fitter.
Well up in all its Branches, or would take charge of a Small Works.
State wages to No. 2428, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

THE Advertiser is in want of a Situation as FITTER. Accustomed to Iron and Compo. Pipe, Service Laying, and Meter Repairing. Thoroughly practical in these branches. Highest Testimonials.
Address No. 2427, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, by a practical Man, a Situa-tion as MANAGER or FOREMAN of a Gas-Works. A thorough knowledge of the manufacture of Gas and Sulphate of Ammonia on the most approved principles.
Address No. 2426, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

ADVERTISER desires Engagement either as SECRETARY, ACCOUNTANT, or ASSISTANT MANAGER. Twelve years' experience in Gas-Works Management and Accounts, also Thirteen years' in Municipal Accountantcy. First-class testimonials.
Address No. 2416, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a good, steady Gas-Fitter for Compo. and Iron Pipes, Cookers, Gas-Fires, Meters, &c.
State wages, &c., to No. 2425, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

PUPIL WANTED.

A GAS and Water Engineer and Manager is desirous of taking a PUPIL, and will be pleased to Correspond with Persons who may wish to enter upon a career in these Professions.
Communications should be addressed to No. 2424, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Representative to in-troduce new Patented Machinery into Engineering, Gas, and other Works. Need not interfere with existing engagements.
Experienced Travellers only need apply, by letter, to No. 2422, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Second-hand Tower SCRUBBER. Diameter 5 or 6 feet; cubical capacity, not less than 600 feet.
State Particulars and Price to J. G. HEYLIN, 10, Walbrook, LONDON, E.C.

WANTED, for Hire or Purchase, two RAILWAY TANK-WAGGONS for Ammoniacal Liquor.
Address, stating Dimensions, and other full Particulars and Terms, Box 423, G.P.O., MANCHESTER.

CYANIDES.

WANTED, Particulars of manufacture from Gas Liquor and Spent Oxide. Communications treated as confidential.
Mr. BROTHERTON, Commercial Buildings, LEEDS.

GAS CARBON—4-ton Loads and up-wards purchased by the BRIMINGTON CARBON COMPANY, Sowerby Bridge, YORKSHIRE.
State Price f.o.r. at nearest Station to Gas-Works.

TO TAR DISTILLERS AND OTHERS.

THE Directors of the Isle of Thanet Gas Company are prepared to receive TENDERS for about 80,000 to 90,000 gallons of TAR, or less quantity, at their Works at Margate, to be delivered and taken between the 1st of October and the 31st of December next.
The Tar will be pumped into Tanks or Barrels on the Company's Premises; but all other costs and charges are to be paid by the Contractor, and no question as to the quality or quantity of the Tar can be entertained after its removal from the Company's Works.
Terms: Net cash, monthly.
Tenders to be sent in on or before Thursday, the 13th of September, 1894, addressed to the Chairman of the Company, and endorsed, "Tender for Tar."
Any further Information can be had on application to the undersigned.
The Directors do not bind themselves to accept the highest or any tender.

By order,
H. H. JONES,
Manager and Acting Secretary.
Gas-Works, Margate,
Sept. 1, 1894.

HYDRATED OXIDE OF IRON.

PREPARED from pure Iron
Two or three times as rich as Bog Ore.
Strong action on Sulphuretted Hydrogen.
To be used alone, but will increase activity of other Oxides.
Less than half the price of Bog Ore.
Can be lent on hire.
Write for tabulated results.
READ HOLLIDAY AND SONS, LIMITED, HUDDERSFIELD.

SADLER AND CO., LIMITED, MIDDLESBROUGH; ULVERSTON (BARROW); PORTSMOUTH; CARLTON; STOCKTON; 315, St. Vincent Street, GLASGOW; and 85, Water Street, NEW YORK. Tar Distillers, Manufacturers of all TAR PRODUCTS, ALIZARINE and other TAR COLOURS, BICHROMES, OXALIC ACID, ALKALIES, LIQUOR AMMONIA, AMMONIA SULPHATE, &c.
Head Office: MIDDLESBROUGH. Correspondence invited.

AMMONIA SATURATORS.

WALTER THOMASON and SONS, Chemical Plumbers, &c., and Makers of Lead Saturators, &c., 21, WESTON STREET, BOLTON. Repairs of every description.
Please write for Estimate before ordering elsewhere.

EXHIBITION OF GAS APPLIANCES.

AN Exhibition of Gas Appliances will be held in the Borough Hall, Stafford, commencing on Oct. 17, and continuing until the 20th.
MANUFACTURERS and others DESIROUS OF EXHIBITING can obtain FULL INFORMATION on application to Mr. J. F. BELL, Gas Offices, STAFFORD.

BOROUGH OF BRIGHOUSE.

TO IRONFOUNDERS.

THE Gas Committee are prepared to receive TENDERS for the supply and delivery of 2200 yards of 6 in. diam. CAST-IRON GAS-MAINS.
1600 „ 4 in. „ „ „
600 „ 3 in. „ „ „
60 CAST-IRON LAMP PILLARS.
Specification and Form of Tender can be had on application to the undersigned at the Public Offices, Brighouse.
Sealed tenders, endorsed on the outside "Cast-Iron Mains" or "Lamp Pillars" as the case may be, are to be sent in on or before Monday, the 17th day of September, addressed to the Town Clerk, Public Offices, Brighouse.
The lowest or any tender not necessarily accepted.
By order,
JAMES PARKINSON,
Engineer.
Public Offices, Brighouse,
Aug. 30, 1894.

BOROUGH OF BRIGHOUSE.

TO MAIN LAYERS.

THE Gas Committee are prepared to receive TENDERS for the LABOUR ONLY for DIGGING AND LAYING
2200 yards of 6-in. CAST-IRON GAS-MAINS.
1600 „ 4-in. „ „
600 „ 3-in. „ „
Specification and Form of Tender can be obtained on application to the undersigned at the Public Offices.
Sealed tenders, endorsed on the outside "Main Laying," are to be sent in on or before Monday, the 17th day of September, addressed to the Town Clerk, Public Offices, Brighouse.
The lowest or any tender not necessarily accepted.
By order,
JAMES PARKINSON,
Engineer.
Public Offices, Brighouse,
Aug. 30, 1894.

By Order of the Directors.—£6000 Debenture Stock of the Tottenham and Edmonton Gaslight and Coke Company.

MR. ALFRED RICHARDS will sell by AUCTION at the Mart, E.C., on Tuesday, Sept. 11, at Two o'clock, in Lots, £6000 PERPETUAL FOUR PER CENT. DEBENTURE STOCK of the TOTTENHAM and EDMONTON GASLIGHT AND COKE COMPANY, to be raised in pursuance of the Tottenham and Edmonton Gas Act, 1882, and offering to Trustees and others an Investment of the soundest character.
Particulars of the SECRETARY, at the Offices, TOTTENHAM; and of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C., and TOTTENHAM.

BRIGHTON & HOVE GENERAL GAS COMPANY.

TO THE PROPRIETORS.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of this Company will be held at WINCHESTER HOUSE, No. 50, OLD BROAD STREET, LONDON, on Friday, the 14th of September, 1894, at Two o'clock in the afternoon precisely, to receive the Report of the Directors and the Accounts of the Company for the Half Year ended the 30th of June, 1894, to declare Dividends, to elect a Director in the place of the late Mr. George Edward Forrest, to elect Auditors (one in the room of Mr. Robert Hesketh Jones resigned), and for other purposes.
The Transfer Books of the Company will be closed from the 1st of September to the 14th of September, both days inclusive.

By order,
W. H. HARDY,
Secretary.
5, Great Winchester Street,
London, E.C., Aug. 16, 1894.

MICHAEL AND WILL ON GAS AND WATER
On the 17th of September will be ready, in One Volume, Royal 8vo., 32s. cloth,

The Law of Gas, Water, & Electric Lighting.
New Edition.
Re-written and brought down to date by
J. SHIRESS WILL, Q.C.
London: BUTTERWORTHS, 7, FLEET STREET. (Her Majesty's Law Publishers.)

HOLMSIDE GAS COALS.
(Wrought out of Holmside and South Moor Collieries.)

PRESENT production 4000 tons per working day. Area of coal about 5000 acres, including the largest remaining workable proportion of pure HUTTON SEAM GAS COAL. Analysis of HOLMSIDE GAS COAL *in bulk as shipped* gives 10,500 cubic feet of Gas per ton, of an Illuminating Power of 16¼ candles. The Sulphur is about 1 per cent., and the Ash 1¾ per cent. The Coal cokes well, and leaves about 70 per cent. of excellent Coke. To show the progress of HOLMSIDE COALS, it may be mentioned that the quantity carbonized by the London Gas Companies in 1885 was about 200,000 tons; whereas the present consumption of HOLMSIDE COALS in London alone is at the rate of nearly
600,000 Tons per Annum.

Full particulars on application to
MR. MARK ARCHER,
HOLMSIDE AND SOUTH MOOR OFFICES,
NEWCASTLE-ON-TYNE.

HEBBURN MAIN GAS COALS.

Yield of Gas per ton	10,500 cubic feet
Illuminating Power	16·4 candles.
Coke	68 per cent.

For prices, f.o.b. Ship or Delivered by Rail, apply to
THE WALLSEND & HEBBURN COAL COMPANY, LTD.
B Lombard Street, NEWCASTLE-ON-TYNE.
W. RICHARDSON, Fitter.

HUNTER'S
OXIDE OF IRON.
JAMES HUNTER, LESSEE, MINER, AND SHIPPER OF
NATURAL IRISH BOG ORE.
This Estate yields the finest and most uniform quality in Ireland; and the quality is guaranteed.
Samples and Prices on application.
11, BAY STREET, PORT GLASGOW.
Telegrams: "HUNTER, PORT GLASGOW."
Established 1872.

BOLDON GAS COALS.
Worked by THE HARTON COAL CO., LTD.
Output about 3000 tons per day.

ANALYSIS—

Yield of Gas per ton	10,500	Cubic Feet.
Illuminating Power	16·9	Candles.
Coke	66·7	Coke.
Sulphur	0·86	Sulphur.
Ash	2·04	Ash.

Boldon Gas Coals are supplied under contract to
The Gaslight and Coke Company, South Metropolitan Gas Company, Commercial Gas Company, Imperial Continental Gas Association, European Gas Company, L'Union des Gaz (the Continental Union Gas Company), Crystal Palace District Gas Company, Bombay Gas Company, Ipswich Gaslight Company, Devonport Gas Company, Sunderland Gas Company, South Shields Gas Company, and to many other Companies at Home and Abroad.

For prices, &c., apply to the
HARTON COAL COMPANY, LIMITED,
Newcastle-on-Tyne.
W. H. PARKINSON,
FITTER.

REMOVING CARBON FROM GAS-RETORTS.

GOOD & SPENCER'S

PATENTED METHOD

Is a simple and inexpensive process, as it will clean a Single or Double Retort in **from 15 to 30 minutes**; thus saving time and loss of Gas through the Retorts being left out for **Scurfing in the usual way.**

For Royalties, &c., apply to **J. E. & S. SPENCER, 14, Gt. St. Thomas Apostle, London, E.C.**; and for Scurfing-Tool, price 36s. per dozen, to **JOHN SPENCER, Globe Tube Works, Wednesbury.**

PRICE'S PATENT COKE & COAL BARROW

effecting a great saving of time, labour, and expense.
For particulars, price, &c., apply to Mr. E. PRICE, Inventor and Patentee, 22, Alwyne Road, Canonbury, LONDON, N.

Prices are Reduced.

TAR AND LIQUOR PURCHASED.

JOHN CLARKSON MAJOR,

(Established 1851,)

Tar Distiller and Manufacturing Chemist,

WOLVERHAMPTON.

UNEQUALLED.

Gas Companies are solicited to try Samples of the

MIRFIELD

BLACK BED GAS COAL.

Prices and Analysis on application.

MIRFIELD (GAS-COAL) COLLIERY COMPY.
RAVENSTHORPE, NEAR DEWSBURY.

LOW MOOR BLACK BED

GAS COAL.

YIELD OF GAS PER TON · 10,375 CUBIC FEET.
ILLUMINATING POWER · 17·50 SPERM CANDLES.
COKE · · · · · · · 75 PER CENT.

Prices, f.o.r. or f.o.b, on application to

GEORGE & JOHN HAIGH,

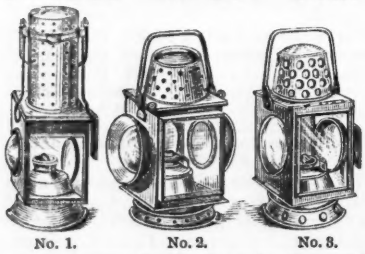
RAVENS LODGE AND CONYERS' COLLIERIES,

DEWSBURY.

A TRIAL IS RESPECTFULLY SOLICITED.

ARMSTRONG'S PATENT

CANDLE SAFETY LAMPS.



No. 1. No. 2. No. 3.

43, MANCHESTER STREET, GRAY'S INN ROAD, W.C.

NEWBATTLE CANNEL.

Highest Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO

THE LOTHIAN COAL COMPANY,
LIMITED,
NEWBATTLE COLLIERIES,
DALKEITH, N.B.

JAMES OAKES & Co.,

ALFRETON IRON-WORKS, DERBYSHIRE,
AND
Wenlock Iron Wharf, 21 & 22, Wharf Road, CITY ROAD, LONDON, N.,

Manufacture and keep in Stock at their Works (also large stock in London)

PIPES and CONNECTIONS, 1¼ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE. — Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with bolts, nuts and covers, and rendering leakage impossible.

LONDONDERRY GAS COALS

FROM THE

MARQUIS OF LONDONDERRY'S COLLIERIES,

COUNTY OF DURHAM.

Available output up to 5000 tons per day.
Yield of Gas 11,000 cubic feet per ton of Coal as per analysis by Mr. John Pattinson, F.C.S., F.I.S.

FOR PRICES AND PARTICULARS, APPLY TO

S. J. DITCHFIELD,

SEAHAM HARBOUR, COUNTY OF DURHAM.

CAST-IRON PIPES

FOR GAS AND WATER.

Pipes, One to Six inch Bore, kept in Stock. Also a very large assortment of all sizes of Bends, T-pieces, and Specials ready for despatch on receipt of Order.

VALVES

FOR GAS, WATER, AND STEAM.

TELEGRAMS: "PIPES GLASGOW."

WM. MACLEOD & CO.,

56, ROBERTSON STREET, GLASGOW.

T. B. KITTEL, SHEFFIELD.

CONTRACTS FOR SUPPLIES OF ANY OF THE PRINCIPAL

ENGLISH & SCOTCH CANNELS.

REAL SILKSTONE GAS COAL

ANALYSIS AND PRICES ON APPLICATION.

T. B. KITTEL, SHEFFIELD.

THOMAS TURTON AND SONS, LIMITED,

SHEAF WORKS, SHEFFIELD,

MANUFACTURERS OF

FILES OF BEST QUALITY FOR ENGINEERS.

STEEL OF ALL DESCRIPTIONS.

SCREW STOCKS, TAPS AND DIES,
SPANNERS, RATCHET BRACES, LIFTING JACKS,
ANVILS, VICES,
AND ENGINEERS TOOLS GENERALLY.

London Office:

90, CANNON STREET, E.C.

THORNLEY GAS COALS

WORKED BY THE

WEARDALE IRON AND COAL COMPANY, Ld.

OUT OF THEIR

THORNLEY AND WHEATLEY HILL COLLIERIES.

The Analysis made by Messrs. J. and H. T. Pattinson, Public Analysts for Northumberland, gives 10,500 cubic feet of Gas per ton, with an Illuminating Power of 16·3 Candles and 67·3 per cent. of Coke. The following is a Working Analysis made of these Coals by the Tudhoe and Sunderland Bridge Gas Company:—

[COPY.]

TUDHOE AND SUNDERLAND BRIDGE GAS COMPANY.
Tudhoe Gas-Works,
Spennymoor,
8th June, 1893.

Messrs. The

WEARDALE IRON & COAL COMPANY, LTD.

GENTLEMEN,

For the last two months we have used your **THORNLEY GAS COAL** exclusively at these gas-works; and I have pleasure in herewith giving you the actual results obtained during the trial.

Yield of Gas per ton: 10,300 cubic feet.
Yield of Coke: 13½ cwt.
Illuminating Power of Gas, average of a series of tests, **17 Sperm Candles.**
The Coke was of excellent quality.
The following is a complete ultimate Analysis of the Coal.

	PER CENT.
Carbon	83·128
Hydrogen	5·116
Oxygen	7·401
Nitrogen	0·585
Sulphur	0·620
Ash	3·130
Water	0·020
	100·000

Analysis of the Coke.

Carbon	93·31
Sulphur	0·61
Ash	5·00
Moisture	1·08
	100·00

I am, Gentlemen,
Yours truly,
A. B. COWAN,
Manager.

For Price, &c., apply to the

WEARDALE IRON & COAL Co., Ld.

QUAYSIDE, NEWCASTLE-ON-TYNE.

TROTTER, HAINES, & CORBETT,
Brettell's Estate
FIRE-CLAY & BRICK WORKS,
STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.
Proprietors of
BEST GLASSHOUSE POT & CRUCIBLE CLAY.
SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED

THE
AUTOMATIC MACHINERY
for the Magnificent New Retort-House and Coal-Stores at Rochdale will be arranged for
INSPECTION
FROM THE
8th till the 18th of August;
and we cordially invite Gas Engineers and Managers to visit our works at Aberdeen.

NEW CONVEYOR Co.,
LIMITED,
3 & 4, Lime St. Square,
LONDON.

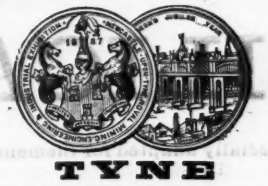
ROBERT MARSHALL,
CANNEL COAL MERCHANT,
97, WELLINGTON STREET, GLASGOW.
Prices and Analysis of all the Scotch Cannels on Application.

THE DRUM
FOR PUMPING AIR, WATER, SEMI-FLUIDS, &c.
See Advertisement in last and next issue.

SEE ADVT., p. 448 OF LAST WEEK'S JOURNAL; ALSO END PAGE OF NEXT ISSUE.

CLAPHAM BROS., Ld., Keighley, Yorks.

Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887, for
CANNEL & COAL.



TYNE BOGHEAD CANNEL.
Yield of Gas per ton . . . . . 13,155 cub. ft.
Illuminating Power . . . . . 38·22 candles.
Coke per ton . . . . . 1,201·68 lbs.

EAST PONTOP GAS COAL.
Yield of Gas per ton . . . . . 10,500 cub. ft.
Illuminating Power . . . . . 16·3 candles.
Coke . . . . . 70 per cent.

SOUTH PELAW MAIN GAS COAL.
Yield of Gas per ton . . . . . 10,500 cub. ft.
Illuminating Power . . . . . 16·3 candles.
Coke . . . . . 73·1 per cent.

For Prices and complete Analysis, apply to
THOS. W. DANCE & SONS,
COAL OWNERS, NEWCASTLE-ON-TYNE;
OR
E. FOSTER & CO.,
21, JOHN STREET, ADELPHI, LONDON, W.C.

Wrought-Iron TUBES
And Fittings and Accessories.

LAMBERT BROS., WALSALL,
MANUFACTURERS OF
WROUGHT-IRON TUBES & FITTINGS for GAS, WATER, & STEAM.
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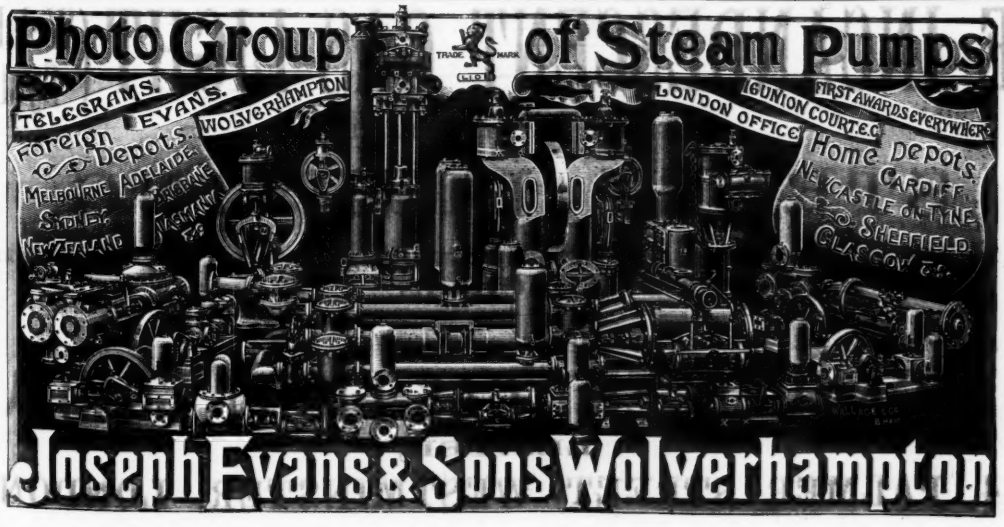

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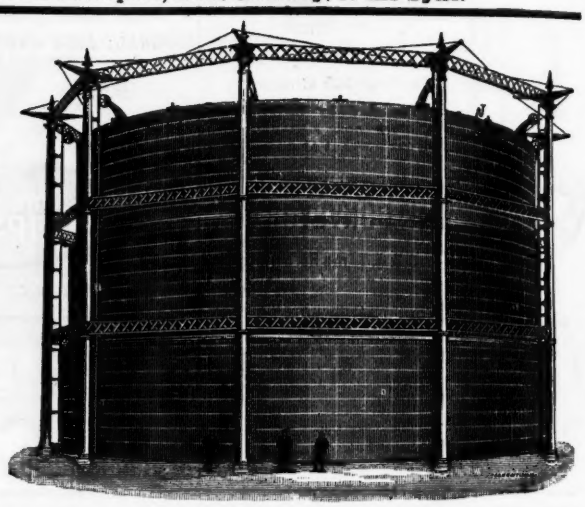

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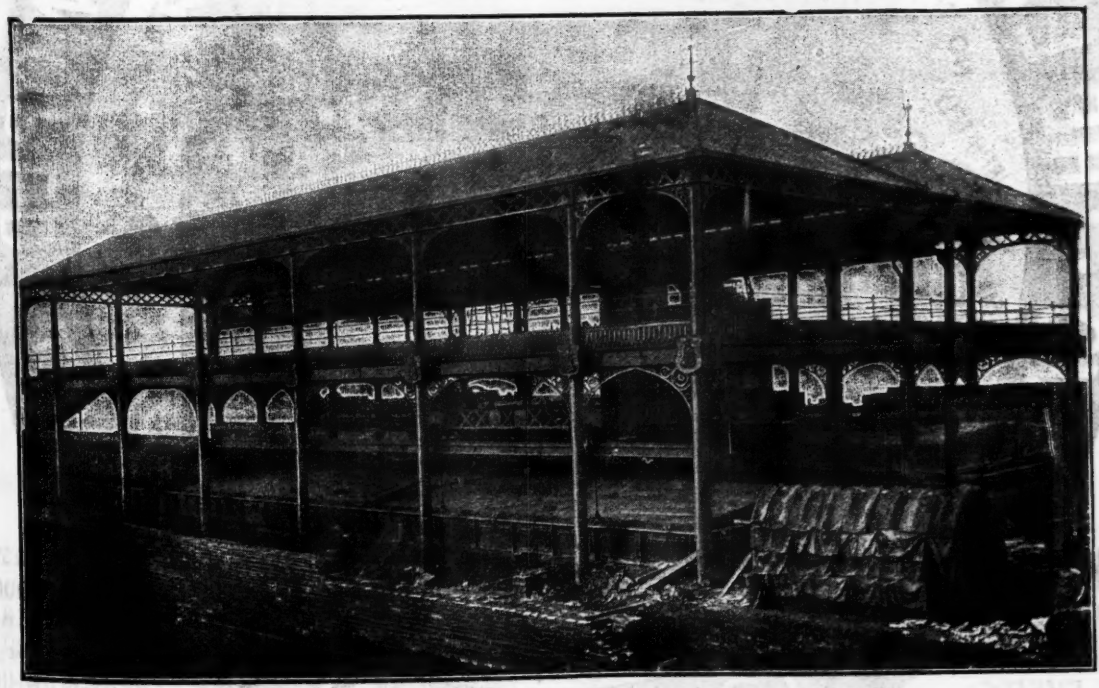

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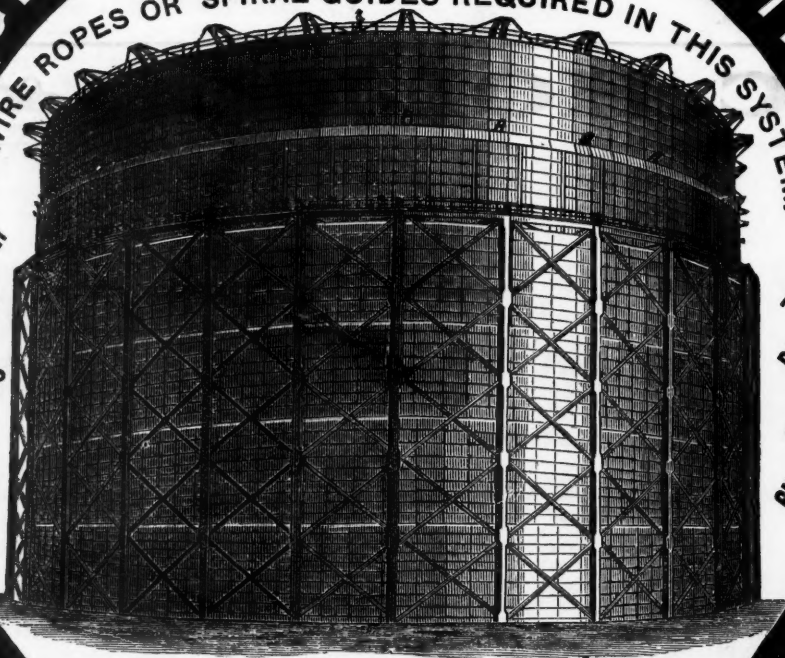

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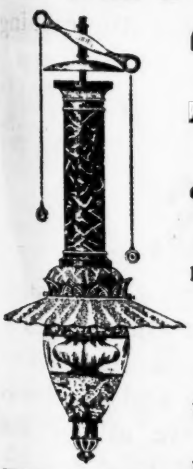

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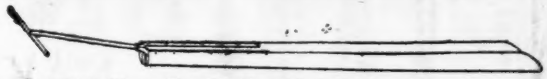

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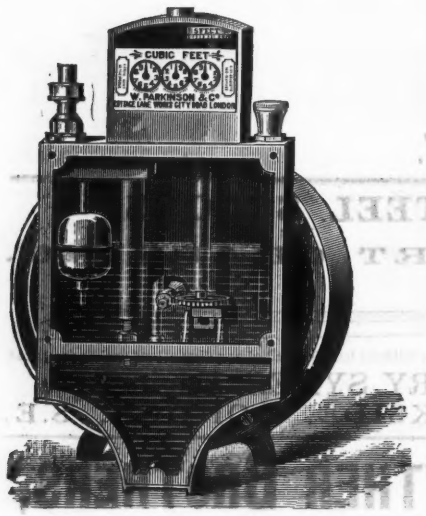

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